University of Alberta

MAPPING USERS' ACTIVITIES AND SPACE PREFERENCES IN THE ACADEMIC BUSINESS LIBRARY

by

Heather Simpson ©

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ABSTRACT

The goal of this study is to better understand how patrons are occupying and using spaces in a small academic library. This research is meant to help with future design of library spaces, and to help researchers and librarians to understand some of the needs and issues that library patrons face in small academic library settings. To enable visualization of the occupied spaces, GIS (Geographic Information System) technology was used to visualize the spaces for a better understanding of library usage. Library patron questionnaires were also performed to better understand the needs and preferences of individuals using spaces in a small academic library. Through an analysis of the occupancy of library spaces with these visualization techniques and a questionnaire to assess patrons' needs and attitudes on the usefulness of the library spaces, a picture of these patrons' information behaviours in the context of physical space becomes clear.

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CHAPTER 1

Research Problem

Introduction

One of the continuing challenges for all libraries, regardless of size or specialization, is the thoughtful and well-planned manipulation of space. Information about space is central to the operations of most organizations, especially in the case of academic libraries, which are often built on a large scale. Library spaces are of great importance to the academic success of students, and libraries are currently dealing with many, and often competing demands for space within the academic setting. Some concerns in academic libraries include trying to accommodate places for furnishings, storage for collections, study space, as well as public and personal computers, along with the many other spaces needed to support staff and services. Understanding spaces is important, as students and other users of academic libraries will "seek spaces that balance the need to find, to reflect and to absorb" (McKinstry 2004, 128) the information and activities in which they partake during their time in the library.

The need for access to technology and changing styles of student learning in the past few decades has become paramount to academic libraries, and these recent changes have made understanding and re-configuring spaces even more complex. It has been noted that students are not only studying, reading, and searching for materials, but that library spaces are also places for social gathering, eating, sleeping and learning through group discussion (see, for example, Shill and Tonner 2003; Powell 2002; Leighton and Weber 1999). In fact, it is not that these non-academic activities (e.g., eating and sleeping) were not happening before, but the use of space in libraries is becoming more complex and the functions of the spaces are changing (e.g., study carrels being used as places for laptop use). In addition, with the realization of these complex changes in library spaces, scholars have increasingly become interested in studying the activities of library patrons, and how the functions of the spaces are influencing how patrons work in and use libraries.

In trying to balance the need for new and different resources, numerous libraries are now having to make structural changes to spaces to fit patron activities (such as the use of laptops) and information seeking behaviours (such as the use of e-journals), in spaces that were designed for physical collections. However, little research examines patrons' current use of library spaces. While some studies of public and academic libraries have been completed in recent years (e.g., Given 2007, Leckie & Hopkins 2002), smaller, specialized libraries have not yet been a point of focus for scholars or librarians. It seems that small library spaces, although likely of great importance to the academic success of students, have been somewhat neglected in current research.

The goal of this study is to better understand how students are occupying and using spaces in a small academic library. This research is meant to help with future design and space allocation of library resources and services, and to help researchers and librarians to understand some of the needs and issues that library patrons face in small academic library settings. Space management tools can be key in helping libraries increase the efficiency and the effectiveness of spaces and services to users. To enable visualization of the occupied spaces, spatial data collection and GIS (Geographic Information System) technology were used in this project to visualize the spaces for a better understanding of library usage. These visualization techniques can be very useful in space design and planning of the library studied here, and the discoveries from this study are also are useful for planning in other small academic libraries. Through an analysis of the occupancy of library spaces with these visualization techniques and a questionnaire to assess patrons' needs and attitudes on the usefulness of the library spaces, a picture of these patrons' information behaviours in the context of physical space becomes clear.

Problem Statement and Objectives

This study was designed to discover who is using the spaces in a small university library, and for what purposes these spaces are being used. The study investigated the space and use preferences of library users across the span of one academic term, with an emphasis on how technologies (e.g., laptop and library computers) are used in this environment. Recently, studies have shown that with the increased use of technologies, study and work spaces are no longer of sufficient size (Ramsay 2002) or design. For example, users now require work spaces with power outlets, additional lighting, or places where quiet conversation and comfortable seating are available. Spaces inside libraries have often been largely regulated and quantified to try to meet the needs of users, such as through the use of standardized spatial proportions per library patron. For example, Leighton and Weber (1999) suggest formulas used to determine the percentage of students for whom seating accommodations are required; these depend on multiple factors such as number of library facilities on campus, the quality of collections, the curriculum, and the percentage of graduate students (724).

However, recent developments in technologies used in libraries (e.g., wireless networks), have made space reconfigurations more complex. For example, according to Bazillion and Braun (2001), librarians are advised by design consultants to provide enough electrical power access for patron use, but often fail in this aspect of library planning (e.g., power connections can turn out to be awkwardly located after furniture is installed) (102). For libraries now having to re-wire and create additional electrical power outlets where none have existed, these additions can be very difficult and costly to make. However, these changes have become necessary as library spaces serve an important function in helping students and faculty to achieve academic goals.

Little work has been done in trying to better understand specialized library spaces. This research examined the uses and occupancy changes that occur in the utilization of the spaces in a library setting throughout one academic term, offering future direction to librarians and decision makers in the design of information spaces that best suit the students' diverse needs. The goals of this project were to discover

1) Who is using the spaces in the library? How are they using these spaces?
2) What are patrons' preferences, attitudes and issues regarding the spaces in the library?
3) How and what kinds of technologies are being used in the spaces?
4) How can we make use of new technologies for data collection and analysis such as a Personal Digital Assistant (PDA) (for data collection) and GIS technology (as an analytic tool) to better understand and visualize the use and potential allocations of spaces and occupancy in this type of library?
5) Is GIS an appropriate tool to visualize use of small library spaces?

These research questions were designed to frame the study of the daily utilization of spaces within a small academic library setting. The measurements involved observation of occupancy in each area at designated intervals for two days during three months of the fall term to give a snapshot of a typical day in the library. These measurements will guide librarians and decision makers in executing changes in the layout and design of areas, and expanding or renovating existing spaces. In addition, this research demonstrates some of the opinions, preferences and issues that patrons encounter when using a small academic library, which also helps to shape understanding of use and possible design of these spaces.

Background and Justification

This project extends the research that is currently underway by Dr. Lisa Given on the same university campus. This project, entitled "University as Information Space, Exploring Undergraduates' Information Behaviours" focuses on undergraduate experiences across the University of Alberta's campus; it includes in-depth interviews with undergraduate students, as well as an observational "sweeps" technique used in two of the larger libraries on campus. This study unveiled a great deal about what some undergraduates thought about spaces on campus, and the types of activities and use of spaces that occur in some of the larger libraries at the University of Alberta. Some of her preliminary observations noted that technology was being used extensively in many of the spaces, and that areas where items such as laptops could be used were very popular with students (Given 2007). However, as this larger study took place primarily in the larger libraries on campus, an investigation of the spatial preferences and behaviours of patrons in a smaller and more specialized library, such as the Winspear Business Reference Library, effectively extends Given's work.

Also, including a GIS component further extends Given's observational work, to include visualization techniques to assess users' activities. GIS is being used in many faculties and disciplines at the University of Alberta, including earth and atmospheric science, civil and environmental engineering, renewable resources, biological sciences, psychology, native studies, ecology, history and classics, and business (University of Alberta 2006). However, GIS has not been explored as a research tool in Library and

Information Studies (LIS) for this type of research. This study aims to use this tool in the LIS context to see if GIS is a useful and appropriate tool to visualize patron use of library spaces in this type of setting.

The Winspear Business Reference Library

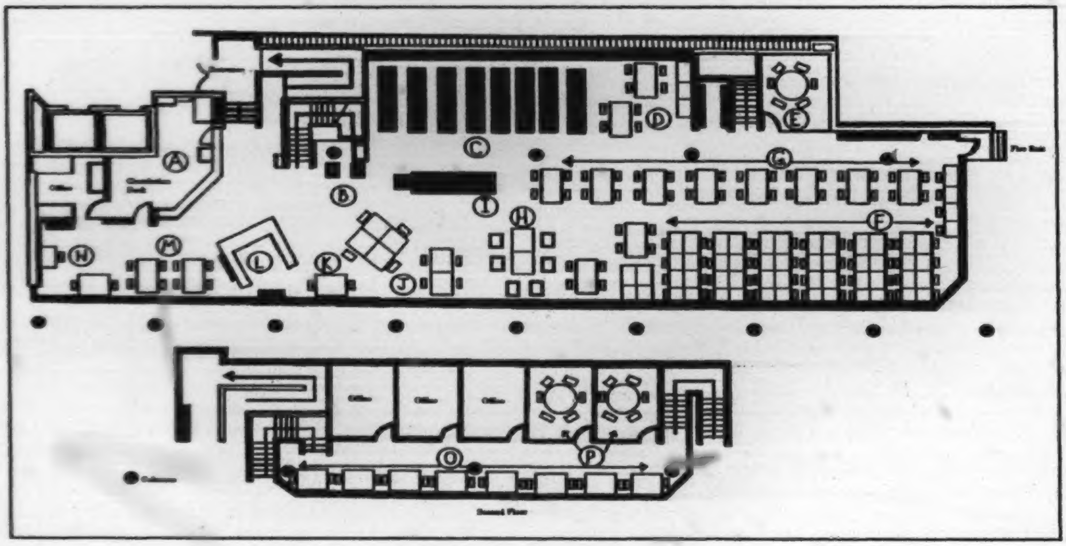
This study took place in the Winspear Business Reference Library at the University of Alberta. This library offers patrons a wide variety of spaces to occupy in a smaller area than most other libraries on the University of Alberta campus. The library is located on the first floor of the Business Building at the University of Alberta, and was opened in the Fall of 1984. Unlike other libraries on campus, the Winspear has not gone under any structural changes since its opening. Other libraries on campus (e.g., the larger Cameron (Science and Technology) Library and the J.A. Weir Memorial Law Library) have been renovated to respond to technological advances and changing styles of student learning, the increasing use of laptops and the increasing need for group work and discussion. However, as no changes or large-scale renovations have taken place at the study location, it an ideal library to assess the impact of new technologies on users' library behaviours.

The Winspear Library contains the non-circulating business reference collection, the reserve collection for graduate courses, and current issues of popular business newspapers. Wireless access is provided for the entire facility, and there are network outlets in twenty of the study carrels. In addition, at the time of the study, there were sixteen computer stations, including eight 'productivity stations' (i.e., where patrons can use Microsoft Word, and other Office Suite applications for writing reports and projects, as well as full Internet access); eight 'quick access' computer stations (with full internet and online library catalogue access, with use limited to ten minutes or less); and four stations dedicated to CD-ROM databases and specialized financial databases. The current seating capacity for this library is 74 individual study carrels, table seating for 48 (with 4 people per table), and three group study rooms that seat 18 (six people per room). Figure 1 shows one of the study locations available for patron use.

Figure 1 – Work table and carrels in the Winspear Business Reference Library.

The Winspear Business Reference library (henceforth called 'the Winspear') provides reference service to the entire University of Alberta (U of A) community; this includes in person, e-mail, phone, and web reference services, especially related to business subjects. The staff of the Winspear consists of two full-time and one part-time professional librarians, as well as four full-time employees and casual staff. Most of the patrons of this library are undergraduate, masters, and PhD students, but it is also used by sessional instructors, support staff, and various employees for centres and career services around campus. The diversity of patron types that use this library was another reason that this location was chosen for the study. .

This library is heavily used as a study/socializing space and for computer use, and operates like a mini 'information commons' with a specific subject expertise. An 'information commons' is defined as "a new type of physical facility specifically designed to organize workspace and service delivery around an integrated digital environment" (MacWhinnie 2003, 243). The Winspear has been going through a "systematic downsizing of its physical collection over the past five years to free up additional space for studying and computers" (E-mail correspondence with library administrator). Figure 2 shows the library's current floor plan.



A- Circulation Desk
B- Photocopiers and Printers
C- Book stacks
D- Work area
E- Group room one (first floor)
F- Study carrels
G- Work tables
H- Comfortable couches
I- Newspapers and current events
J- Computer terminals
K- Microfiche
L- Reference Desk
M- Computer workstations (productivity)
N- CD-ROM stations
O- Work carrels (second floor)
P- Group rooms (second floor)

Figure 2 – Existing Map of the Winspear Business Reference Library. Modified by the author from an original hand-drawn map of the library.

This study could not have been possible without the help of the staff at the library. An administrator at the library provided invaluable guidance and resources in terms of maps of the library and open access for the observational sweeps. In addition to this, the researcher was careful to become familiar with library staff, and to explain the study to all library employees, so that they would feel comfortable asking questions, and would also be able to answer any queries that the library patrons might have regarding the nature of the activities of the researcher. All of the staff at the business library provided great feedback, ideas and insight throughout the length of the study period and analysis of this research.

This study used a combination of methods to achieve a well-rounded picture of library space usage (see Chapter 3 for details). These methods included the use of observational 'seating sweeps' with a PDA, GIS visualization techniques, and library patron questionnaires. Some of these research approaches, such as the use of the PDA and the GIS visualization, are relatively new to the field of LIS. PDAs are a recent development in techniques for data collection, and enable the researcher to gather observational data more unobtrusively than with the traditional pencil and paper method (Hecht 1997). GIS visualization is a tool that has long been used in such disciplines as nursing and health, biology, environmental sciences, urban and human geography, and other social sciences (e.g., Keller, Fox and Rees 2006; Miller and Knoun 2006; Caley 2004; Stewart et.al 2004; Mennis 2002; Mitchell, Dorling and Shaw 2002); however, this has never been used on a small scale for the analysis of observational data in the library setting for an entire library space. As such, this project not only uses new methods and research in the realm of LIS, but also crosses over into the discipline of Humanities Computing – where the researcher has used technology to better understand human activities and preferences in a dynamically changing environment.

Chapter 2

Literature Review

Introduction

Libraries, and how patrons are using library spaces, are currently undergoing many changes. Academic librarians and LIS scholars have debated the future of the library, as technological advances and shifting uses of spaces on campus have given increasing urgency to these discussions in recent years (MacWhinnie 2003; Shill and Tonner 2003; Carlson, Reichel and Marcum 2001). Given the availability of off-site access to databases and Internet resources, some people have questioned the need for the physical library at all, while others believe that the recent changes to library spaces help to augment the library as "place" (e.g., Buschman and Leckie 2007). Although many guidelines on the design of spaces have been published (e.g., Bazillion and Braun 2001; Leighton and Weber 1999) and numerous studies on library patrons have been explored (e.g., Jankowski, Hertel and Young 2006; Kuh and Gonyea 2003; Whitmire 2002), little research examines patrons' use of spaces and their personal preferences in small academic libraries. In addition, the large variety of activities occurring in these spaces (such as the use of technology and the use of the library for discussion and group work), also call for new ways of examining and visualizing the spaces. The exploration of the use of small academic libraries by patrons, as well as patron preferences and needs surrounding spaces in these environments is vital to planning and designing library spaces that fit the needs of users.

The Academic Library as "Place"

The value of the academic library as "place" in the university community has recently been debated in the popular and scholarly literature (e.g., Buschman and Leckie 2007). Some believe that with the increased use of online resources the physical structure of the library is becoming less useful, while others see the changes in the use of libraries as an augmentation of these institutions as part of the public infrastructure. Academic libraries have recently learned from their competitors, such as bookstores and Internet cafes, that it is important to support patrons' personal needs; many have altered their policies and practices (e.g., allowing food and drink) and introduced comfortable furniture, multimedia instruction rooms, group study areas, and areas where patrons can talk and collaborate on projects (Albanese 2003). These issues and changes have greatly affected the decisions of library planners and designers when considering library spaces.

The "Deserted Library"

According to some authors, the increasing availability and popularity of online library resources renders the building itself obsolete (Engel and Antell 2004). Some people have predicted the demise of the physical library building as library resources are increasingly delivering full-text content to desktops. Carlson (2001) discussed the idea of the "deserted library", where academic libraries will become increasingly empty. According to the author, the decrease in gate counts (i.e., patrons entering a library) and decreased circulation numbers of physical collections in academic libraries, can be attributed to patron use of web-based resources and an increase in students' use of alternative spaces such as dorm rooms, coffee shops and bookstores. This discussion brought forward numerous responses from academic librarians who disagreed about the decrease in use of library spaces on campus; however, all agreed that libraries have been facing new challenges with the reconfigurations of space (Carlson, Reichel and Marcum 2001).

In the past, there was a great deal of discussion regarding "the death of the book" outside of LIS literature. Numerous articles and books were published on the future of the book, which was assumed to be brief. Many believed that with the electronic age, books and even paper would soon become obsolete, with important implications for the library. Finnerty (2002) discusses the evolution of special libraries as a "path away from stacks" and large "just in case" collections (7). Some believed that without books, there would only be need for a virtual library from which to access electronic materials (Warwick 2004). However, it is now clear that print scholarship is very much alive and well. According to MacWhinnie (2003), the academic library is not doomed by technology, but remains essential to the university campus. The author found that print resources are not 'dead', nor do they show signs of becoming obsolete. Publishers continue to publish in print and show little inclination of moving to a digital format to disseminate information. Books are published in larger numbers every year, and libraries continue to add these materials to their collections. In addition, in 2003 only approximately 6 to 8 percent of academic journals are available in full-text online, and half of those were only available by subscription (MacWhinnie 2003, 242), and this number has certainly increased since this time. Even with the shifting emphasis from print to electronic, there is a continual need for physical space for collections, and for the technology to use both the physical collection and the electronic resources that are available in the library. The physical space of the library is also necessary to provide traditional services to users (e.g., inter-library loan and circulation) as well as help with technical aspects of information-related activities, work areas for librarians and staff, quiet study space, and storage for print collections.

According to Houlihan (2005), university students not only need libraries, but they want them. Students see libraries as providers of information and resources, and need them for the help and guidance that library staff can provide through reference services and information literacy programs. In addition, they want libraries to provide an atmosphere conducive to the way that they now study, do research and communicate: i.e., they want to do these things in a supportive communal environment, surrounded by like-minded people, all of whom may struggle with similar issues and problems of an academic, economic, and social nature.

Space Planning in the Library

Library users are concerned with space, especially in the case of academic libraries where spaces may contribute to the success of students attending the university or college (Kuh and Gonyea 2003). Some concerns in academic libraries include trying to balance places for furnishings (such as carrels, couches, worktables), storage of collections, study spaces, library and personal computers, and the many other spaces needed to support staff and services (Bazillion and Braun 2001; Leighton and Weber 1999). In the past few decades, standards for spaces in facility planning have been regulated and used in interior design by academic libraries. Properly proportioned areas for reading, browsing, reference help, and study inside the library space generally attempt to cater to all the needs of library users. Leighton and Weber (1999) discuss numerous guidelines and suggestions for planning the spaces for book stacks, seating, floor areas, and computer terminals (714-753). Among these, the authors describe how seating accommodations for readers and related services (such as reference) are the largest spaces in most libraries. Guidelines for the types of seating arrangements for academic libraries includes tables for four or more (not more than 20 percent); lounge chairs (not more than 15 percent); and individual accommodations (up to 85 percent) (Leighton and Weber 1999, 723).

Space planning has previously been done by counting the seating capacity at a library, as well as counting the square feet per average occupant. The Library Association standards exist which have been adopted by many libraries in quantifying areas to aid in space planning. For example, the "Standards for College Libraries" (adopted by the Association of College and Research Libraries in 1995), include formulas for space requirements based on student enrolment, space for books, and space for staff. However, guidelines for smaller academic libraries are not found in the published literature on and resources for library design and planning.

Leighton and Weber (1999) relate space planning to student enrolment (734 - 737). The emphasis on the student user is in line with students being the largest group of users in library facilities, and matches one of the prime objectives of most academic libraries – i.e., providing suitable study spaces for this particular group. In addition to this, Ramsay (2002) argues that the formulas used by academic libraries when planning spaces are deficient in several respects, as they do not provide sufficient reader space when equipment is required to access information (such as computers, microfiche readers, or personal laptops). Jones (2003), a library building consultant, describes how libraries must plan for a flexible design and the ability to support new space configurations, technology, and wiring changes for the future. The author believes that if a building is adaptable, that the library will be able to cope with whatever may come in the future. It seems clear that with the increase in remote access and the speed of changing technologies, further thought regarding the flexibility of physical space planning and design is required.

Book Storage and Collections

One of the major problems that most academic libraries face is the expansion of library collections and the re-organization of space (Fraley and Anderson 1990; Blume and Kempf 2003). Every year, libraries acquire new materials, which are then placed on the shelves for the use of library patrons. Ways to save space in the academic library have resulted in the analysis of library collections to determine space requirements for future collection growth (Leighton and Weber 1986). One technique described by Fraley and Anderson (1990, 50) is averaging the number of pieces added to the collection during the past five years and considering this the annual growth number. Another method is the adjustment of the collection content following “zero-growth” or “weeding”, where books that are not used are discarded to make room for other books. At the University of Alberta, weeding must be done on a discipline-by-discipline basis; in the case of business literature and resources, weeding is done more frequently due to the fact that these date quickly. In the University’s library system, future collection projections are not done; however, a general look at use of space takes into account the journals and resources that need to be moved to a remote location to free up additional space for seating or computers. As a result, print collections are shrinking, freeing up more spaces to put in workstations where people can access the electronic materials. However, according to a library administrator, “whatever we do in deciding what goes to which shelf and whether or not it stays there is driven by current and predicted user needs”.

These types of methods are essential to help libraries manage space usage for both collection and non-collection areas. Library space planners, formerly able to predict the size and character of print collections twenty to thirty years into the future with some confidence, are now reluctant to project beyond a decade’s growth, especially with regard to periodicals (Foote 2004). Many libraries have already reached their maximum construction potential, and the problem of indefinite growth against a library’s physical space constraints has become a major concern to librarians and library managers (Xia 2004a). New technologies have helped with some of these issues, such as the emergence of electronic resources and microfilms to save collection storage space; however, in the case of print materials, this is not a solution. Chiorazzi (2002) offers his look into planning small academic libraries when the future of the growth of print collections is uncertain. He suggests that a prudent approach for flexible planning includes the use of remote storage, digitization of parts of the collection, redesigned stacks, and compact shelving, as methods that might be considered by library planners (19).

New Technologies, Electronic Collections and Issues of Space

New challenges have arisen in the library setting, as a result of the development of modern technology. The demand for different types of spaces has emerged from the introduction and expansion of electronic resources, and their use by library patrons. The changes that have occurred in the libraries in the past few decades have included the reconfiguration of spaces needed for card catalogues (to accommodate CD-ROM and internet-access stations), and the large numbers of computers and electrical connections for laptops; all of these changes have had various effects on patron use and library services. Also, the change in the way that libraries measure their value and function has changed from a physical description (e.g., book holdings) to a digital one (e.g., online journals). Before digital resources, spaces were tied to the volume of books and other print materials. University bulletins regularly stated the number of volumes their libraries held as a draw for prospective students, and the number of stacks that held the books measured library space (Ramsay 2002). With the change to electronic resources, this has all changed; library planners now struggle to find room for the collections, which to many, seem outdated and underused.

Some studies have shown that spaces and access to electronic resources have become insufficient for students in the university library. Eng and Gardner (2005) found that university planners needed to increase the number of computers in academic libraries. The results of a LibQual survey of undergraduate and graduate students at the University of Alberta indicated similar areas of desired improvement to the university libraries (University of Alberta Libraries 2006). These areas included increasing electronic collections (particularly e-journals) and improving and simplifying access to electronic resources. The library services that were the furthest from undergraduates' desired level of service included library space that "met students' technological needs to help inspire study and learning".

In the past two decades, nearly all university libraries have experienced construction expansion or renovation with the purpose of enlarging their computer networking spaces and facilities (Blume and Kempf 2003). Re-designing and wiring of library buildings is expensive, and according to some authors, flexibility is the key to the continuation of successful library design into the future (Jones 2003; Newman and Metz 1999; Mickalak 1994). The need for "knowledge creation" workspace has encouraged librarians, faculty, and computer specialists to work together to provide all the necessary technology, information and services. This change has had a large impact on the expectations of library patrons toward spaces and services provided by the library, while changes to the actual spaces themselves to accommodate new technology, may have been neglected by library planners.

In addition to unsatisfactory spaces to accommodate users in the academic library are other issues surrounding the increased use of technology in libraries. Issues of new noises and light sources can be very distracting to some users, while the needs of users with particular technologies (e.g., laptops) may not be being met. For example, library lighting guidelines often neglect to specify guidelines for lighting areas for laptop users (Malman 2005; Bazillion and Braun 2001; Leighton and Weber 1999). In addition, Bazillion and Braun (2001) emphasize the need to accommodate the use of laptops in study spaces, but highlight the importance of being aware of keyboard (and other associated) noises, and being sure to soundproof quiet areas (44). McCarthy (2000) suggests solutions for space planning and noise issues resulting from the use of emerging technologies in the library, which include using lower ceilings in areas for public computers to reduce glare from natural lighting, installing direct lighting fixtures, and using sound absorbing materials to reduce distracting noise levels (139).

In a specialized library context, French (2006) describes how law school libraries are still growing, as is the need to house materials in the face of growing electronic collections. In his overview of articles related to law library spaces, he found that physical space is an omnipresent concern for libraries, and that "the library's space needs are evolving not shrinking" (106) in spite of the growing belief by many that everything is online. Chiorazzi (2002) notes that there has been a fundamental change in the use, organization and content of academic libraries, whether the future is exclusively digital or not, and that specialized libraries must plan accordingly. Pengelley (2001) believes that stack spaces will need to decrease as more materials become available in an electronic form or off-site repositories become more common. However, according to this author, the library space that becomes available should be used for expanding comfortable reading and meeting spaces for students. Pengelley believes that the physical library will survive if it can "reinvent our physical surroundings and leverage the desire for access to the new technologies with the much older desire that people have to come together in their physical persons" (636). Although mostly discussing specialized academic law libraries, these solutions may also be useful when considering other specialized campus libraries.

Librarians involved with the challenges of designing and building new spaces or renovating existing library spaces are usually instrumental in seeing that the library's needs are articulated and protected in the design and build process. Early in the process, justifications must be made for new or improved space, answers formulated for questions about technology in the library, and alternatives to building designs must be considered. Bahr (2000) presents arguments in support of new library buildings and renovations to administrators and others who believe that digitization will decrease or eliminate the need for the physical library. The author notes that arguing that libraries are more than just places for books, but also provide learning centres, many different types of spaces for presentations, conferences, and collaboration, as well as social spaces, are some of the ways to defend the need to keep the physical library spaces. Heller (2003) also offers strategies that might be useful to win the support of influential decision makers to renovate or expand law libraries on campus. He suggests that using statistics to create comparisons to peer and competitive law schools, as well as providing visual proof of the need for spaces are some of the ways to fight against those who do not believe that small libraries need physical spaces.

Other spaces in the Academic Library

In addition to book and collection spaces, libraries often provide comfortable reading areas such as sofas or large chairs for those wishing to browse newspapers, journals or literature. Planning additional spaces required for services to patrons should include the online public catalogue (OPAC) area, spaces around the bibliographical, reference, and current periodical collections, public areas, accommodations for microfilm, maps, manuscript, archives, and other collections not shelved in the main stack area, staff working quarters, entrances, lobbies, corridors, stairwells, washrooms, mechanical and electrical equipment spaces, and walls and columns (Leighton and Weber 1999, 728). All of these places and spaces need to be carefully planned and evaluated to ensure that the library is meeting the needs of the users, and is being used effectively.

Study Spaces in the Library

Previous research shows that there is a natural connection between libraries and studying activities, and that few libraries can serve their users well without setting aside space for these academic activities (Crawford 1999). Study space has become a key criterion for measuring the performance of academic libraries; libraries that offer better conditions for study areas and facilities typically have a higher user satisfaction (Whitmire 2002). In general, library study areas are set along the exterior walls or at center squares surrounded by bookshelves (Pierce 1980; Bazillion and Braun 2001; Xia 2005). In central study areas, large tables are provided, each one accompanied by four to eight chairs depending on the size of the table. Group tables constitute nearly all study seating in public libraries, and generally make up the majority of seats in academic libraries (Leighton and Weber 1999).

For many years carrels were considered very important in academic libraries, because they provided users with their own personal territory. Cohen and Cohen (1979) found that carrels were the most popular and welcomed study facility in any academic setting at the time. However, current recommendations for carrel sizes are not able to meet the needs of students with personal laptop computers, which are becoming more and more common in today's academic libraries. A study by Xia (2005) found that tables were preferred to carrels in almost any library occupancy situation. These contradictory findings could well be due to the particular situations or library environments involved in the study, but may also point to library patrons' need for increased space in their personal study area. According to Powell (2002), the provision of varied study space is essential if libraries are to satisfy the needs of individuals and groups, undergraduates and researchers.

The Changing Environment and Function of Library Spaces

Changes in the Traditional Library – Towards a Learning Environment

Libraries have experienced another change in focus; from providing information resources to using the physical library as a learning environment (Bazillion and Braun 2001; Engel and Antell 2004; Powell 2003; Xia 2005). Holmes-Wong (1997) describes how library buildings have moved beyond their original mission of providing space for resources, to providing learning environments for the purpose of creating new knowledge and providing enhanced space for library instruction. As Engel and Antell (2004) also note, "Trends in academic library construction include a shift from planning space for physical materials to planning space for user and user activities, such as learning centres and information utility" (23).

There is a great deal of literature and research that explores the design of learning spaces and implications for student learning, with results that may also be applied to those looking to understand and design library spaces. For example, Long and Ehrmann (2005) discuss the inadequacies of traditional classroom spaces in the face of new technologies, while Johnson and Lomas (2005) highlight the links between theories of learning and the design of spaces on university campuses. Some library space designers have looked to classroom and computer lab planning for guidance on turning library spaces into more of a learning environment. Forrest and Hinchliffe (2005) describe projects where classroom design helped in library project planning. Planners used classroom design to offer a variety of comfortable and flexible learning spaces to support both focused individual and group collaboration. The authors describe how librarians need to "get off the grid", breaking down typical rectilinear configuration shaped by lines of structural columns and rows of bookshelves (Forrest and Hinchcliffe 2005, 297). Chairs that roll up and stack, tables that move, and rolling upholstered chairs with tablet arms that work well in classroom settings are suggested for library spaces. According to

Forrest and Hinchliffe (2005), re-thinking and re-tooling libraries as learning spaces has the potential to make them indispensable to the academic community for scholarship, teaching, and lifelong learning.

The design of library space can either aid or impair the ability of students to achieve their academic potential. In support of the students, the academic library must provide spaces that create identity, absorb changing technologies and provide spaces that enhance information exchange – in other words academic libraries must cater to an increasing range of user activities (Powell 2002, 112). According to Corall and Brewerton (1999), the best approach may be to develop services and spaces that draw on the best of both the traditional and electronic worlds. This has led to the idea of the 'hybrid' or 'integrated' library where new modes of service delivery will exist with traditional print collections. Therefore, academic libraries must provide space for continuing and expanding functions, especially "instruction and interaction, reflection and refreshment" (Corall and Brewerton 1999, 212); refreshment is essential to sustain learning, and is important if students are spending long hours studying in libraries (Powell 2002, 116). Today, students are expected to explore, to experiment, to solve problems, to work in groups, to think laterally, and to interact creatively (Powell 2002, 113). Libraries must therefore shape their learning environments according to these changes. The challenge, then, is not to create totally virtual libraries, but to develop integrated learning environments that are designed for the learning styles of the students working in today's digital environment.

Changes in the Traditional Library – The Information Commons

In order to meet the demands of today's users, libraries are developing new models for providing access to electronic resources and assisting students with their studies. One model for providing technology and information resources is the 'information (or knowledge) commons' (MacWhinnie 2003; Xia 2005). The information commons is usually found in a central location within a library where access to technology and reference services are combined. Computer workstations are grouped together with a help desk and print reference services nearby, and students can search the online catalogue, databases, and use software to prepare for assignments with print resources, technical help and professional research assistance nearby (MacWhinnie 2003, 243). Other 'information commons' features can include collaborative learning spaces, multimedia workstations, hi-tech classrooms, and group study spaces, all designed to help enhance group learning and to provide a technically advanced setting for carrying out information literacy instruction. Once again, library designers can look to other disciplines, such as Education, for a better understanding of the incorporation of technology into classroom design, as well as the impact that technology has on teaching and learning (Sutherland 2004).

Changes in the Traditional Library - The Use of Laptops

As student ownership of portable laptops has grown, it has become increasingly important for libraries to provide access to networked resources in general seating areas, as well as through public access workstations (Shill and Tonner 2003). More and more, librarians are expected to allocate room for laptop computers and digital equipment, while reducing the spaces provided in the library for print collections (Bazillion and Braun 2001; conversations with librarians from the Winspear library at staff meeting, February 2007). Libraries have also seen an increase in the number of students who need to connect to the personal computers with the internet in the library. Student ownership of computers has grown sharply over the past few years, and some institutions are now requiring students to acquire a portable computer. Shill and Tonner (2003) found that declining prices of laptops are making them increasingly the machine of choice for many students (15); this increase calls for wireless networks, lighting and additional wiring to be available to students on a daily basis. The addition of new wiring to infrastructure is an indication of future expansion in some library renovation projects. However, there is some controversy over how to accommodate laptop users properly, while also efficiently delivering spaces to traditional readers (Xia 2005). Thomas (2000) recommends a well-conceived building or renovation program as the basis for a design and states that the challenge for planners is to incorporate as much flexibility as possible when planning for readers and technology users, to accommodate a variety of user spaces and interactions.

She concludes that the ideal design will allow for the coexistence of the physical and virtual library, with spaces that reflect "what really happens in the library to support readers" (415).

Changes in the Traditional Library – A Place for Discussion and Socializing

Another factor that is influencing change in academic libraries is the shift towards cooperative learning (MacWhinnie 2003). Trends in education have been emphasizing collaboration and group study (a response, in part, to increasing class sizes), which has caused a demand for new resources. Foote (2004) notes that pedagogical trends calling for students to work together in larger numbers have affected the need for more and larger group study spaces. Libraries are now including more group study facilities that have access to both the physical and online collections as well as other accessible multimedia tools (MacWhinnie 2003; Foote 2004). A study done by Eng and Gardner (2005) showed that students want and need an increase in spaces for group work, while in a LibQual study from the University of Alberta students also described a lack of group study areas (University of Alberta Libraries 2006). Given (2007) discusses how faculty and librarians identified students' need for spaces that could accommodate noisy as well as quiet activities. The author also describes the shift in the perceived culture of the library – as a place where students are "shushed" to a place that is flexible enough to be used for students' diverse needs (184) – including group work and discussion. A study by Shill and Tonner (2003) describes how group study rooms are generally recognized as an essential component of successful library design today, especially given the emphasis on collaborative learning in recent years. Foote (2004) describes how most librarians and space planners have been recently asked to examine their building with an eye to providing more seminar and group rooms (42). These studies show the need for new spaces (e.g., group rooms, separated areas of 'total quiet') that may not have been a part of traditional library designs. As a result of these changing needs, there is also a need to better understand how library patrons are using these spaces, to be able to design, and plan accordingly.

It is clear that libraries have evolved beyond the traditional services, and continue to transform as places. Wireless networks, virtual reference, and remote access have altered the way that libraries serve patrons, but this has not meant the end of the library as a physical place. A study by Shill and Tonner (2004) showed that students are not deserting academic libraries, but rather making less use of older facilities which lack good computers, network access for laptops and a comfortable environment conducive to a variety of uses (i.e., individual study, instruction, eating, drinking and socializing). Therefore, to remain viable, the library must plan and design spaces that provide the resources needed by students, along with the physical amenities expected, including the latest technology and comfortable study space. The resulting future library will be more a learning and information centre rather than a collection of books and study spaces (MacWhinnie 2003, 254). The early stages of architectural planning do consider future development, but the dynamic changes that have occurred in society in the past few decades especially in relation to technology, are much more drastic than most have expected (Xia 2004b, 375). With the increased uses of technology and changes in the ways that library patrons are expected to engage (e.g., collaboration and team building), librarians need to be on the forefront of designing effective and future-oriented learning spaces throughout the academic library. However, looking beyond the issues of stack spaces and emerging technologies, Crawford (1999) addresses "the diversity of spaces required in tomorrow's libraries and the power of libraries as places" (61). Most libraries will need more study spaces to accommodate changes in pedagogy, meeting spaces for groups and reading and research spaces, all regardless of how much technology moves into libraries. Collections and services, organizational needs, and library missions will evolve, and space planning needs to provide for these changes.

Academic Library Patrons

Patron Preferences in the Academic Library

Space preferences are conditioned by multiple factors in study and reading areas. These can also include sound and light quality, density of seating and occupancy, the degree of familiarity that readers have with each other, cultural and traditional practices, the variance of personalities, and even the difficulty and nature of the reading material (Leighton and Weber 1999, 221). It is suggested that some readers like an active or noisy social environment, while others have a preference for quiet areas with visual privacy (Given 2007; Powell 2002). In a study of public library spaces, Leckie and Hopkins (2002) discovered that about twelve percent of patrons complained the people in the library were "too noisy" (346) and thus disruptive. However, there are no studies of how patrons feel about level of noise in small academic libraries, or their preferences regarding quiet versus noisy spaces in this setting; therefore, scholars must turn to the literature on public libraries to better understand patron preferences and thoughts on spaces.

According to McKinstry (2004), it is no longer good enough to provide only quiet spaces for study and research; "As students seek greater integration of their social and academic lives, they search for the seamless continuum of space and service options" (138). Numerous changes in technology and personal laptop computers can also have a large impact on patrons' preference of spaces in the library. Shill and Tonner (2004) showed that students will search out the libraries or information commons that best meet their needs, such as those with the newest computers or most comfortable spaces. The new emphasis to changing spaces in academic libraries can be seen as a result of patron demands and the influence of technologies and new styles of learning, and these demands influence how spaces need to be designed in libraries.

Once again, academic libraries could learn from studies performed in the public library setting. Leckie and Hopkins (2002), for example, observed that fifty to sixty percent of patrons were involved in studious behaviour (reading), and patrons generally were located at worktables or study carrels to conduct these activities (21). McKechnie et al. (2004) found that work tables were heavily used in all the locations they studied, and that generally users would choose seats at empty tables or (if all of the work tables were occupied by one person), the users would sit at opposite corners, furthest away from one another. Those users who chose to sit at a work table did so almost exclusively to complete homework or study activities (McKechnie et al. 2004). Understanding preferences and use of work and reading spaces that are used by patrons in the public library may also help understand the use and design of spaces in academic libraries.

Given (2007) discusses how little is known about whether the nature and function of the academic library is best suited to students' academic activities or learning preferences. Her study highlighted the opinions of faculty members and librarians from the University of Alberta on the subject of students' needs for information spaces on campus. The study found that faculty and staff believe that students have a need for welcoming spaces, that are comfortable and "filled with bright, natural light" (180); soft chairs, spacious tables, ergonomic workstations, clean surfaces and aesthetic details were all discussed as being conducive to on-campus study. The study also highlighted the need for conversation and collaboration spaces, as well as flexible and social spaces (182). Although this research is helpful for understanding the larger academic library context, there has been no work done on the preferences and opinions of patrons regarding the spaces in small academic libraries.

Patron Information Behaviour in the Academic Library

Along with patron preferences, studies on information behaviours of students in an academic context have important implications for the planning and design of library spaces. Kuh and Gonyea (2003) examined the nature and value of undergraduate students experiences with the academic library. The results of this study indicated that the library plays an important role in helping the students to relate positively to academically related activities, and in turn helping the university to achieve its academic mission. A number of recent studies also look at university students' information behaviours (Whitmire 2001, 2002, 2003; Given 2002) both in the academic setting and in their everyday lives. Holliday and Li (2004) also explore the "millennial generation", students who are especially comfortable with using new technologies to access university resources. Because libraries have an important role in the success of students, and with students leaning more and more towards the use of technologies, the academic library must plan spaces accordingly. Investigating and understanding patron needs and preferences for a small library setting, enables library designers to facilitate patrons' access to the information that they need.

A study by Valentine (1993) revealed that students turn to electronic resources for their research needs, and that they avoid resources that they are unfamiliar with or believe difficult to use. This may well be the case with the use of the physical collection system in a library, as many students may see it as being much more complicated than online resources, which are easily accessed through a computer or laptop. In a study that used both survey and observational methods to investigate business students' research behaviours and attitudes toward information resources, Atkinson and Figueroa (1997) observed that a majority of business students favoured electronic resources over print materials, primarily for their convenience, ease of use, and speed. More recently, Lombardo and Miree (2003) measured undergraduate business students' perceptions and use of the web, online databases and print resources, and found that students saw the web as a convenient, easy to use and comprehensive research tool, but were not blind to the benefits of using other resources as well to complete research projects. However, Atkinson and Figueroa (1997) asserted that business students, by the nature of their discipline, are predisposed to the idea that "time is money", and that they seek immediate tradeoffs in their allocation of time versus the amount of relevant information retrieved in their library research. In addition to this, the authors described the business students as seeing the importance of keeping current with new technologies to maintain a competitive advantage, thus turning to the web the most often for their information needs (63). With evidence to show that business students favour the use of technology in accessing materials, it is no wonder that the library in this study has been moving toward replacing physical collections with more computer terminals and laptop friendly areas.

Research and Techniques to Study Peoples' Use of Space

Studies on the Use of Space Across Disciplines

Generally, studying people's spaces involves a spatial methodology, which can include inventories and mapping of individuals' locations, cognitive or perceptual mapping, activity tracking, and spatial observations (Given and Leckie 2003). Cromley (1999) discusses spatial sampling methods, as well as mapping, and how meaningful research requires an understanding of where individuals are located, and what part of the environment they use so that appropriate sampling schemes can be developed. As well, the author mentions, "A map can be a most useful tool for modeling the locations of individuals and organizations within a community" (Cromley 1999, 97). Given and Leckie (2003) describe how individuals may have social activity spaces that are both private and public, which can be both confined (e.g., private spaces such as a house), or relatively large (e.g., public spaces such as a city). Observation is often used to develop a map of individuals' movements writing a space, and a detailed record associated with those movements documented.

Community and regional activity spaces include neighbourhoods, villages, towns, and cities, even up to a national scale. Studies of activity spaces within the community context are often done by conventional mapping techniques, such as the mapping of particular features, and then superimposing other variables of interest to better understand the distribution of certain spaces, and who might use the presence of those spaces. In these cases, conventional mapping techniques often use manipulation and use of census data, particularly in the case of larger regions such as cities (Given and Leckie 2003, 369). Where to place activity spaces is a major concern to researchers and developers, and models and algorithms surrounding locational analysis (Hodgson & Rosing 1996; Ghosh and Rushton 1987; Sule 2001) have been used for privately owned activity spaces (e.g., retail stores, malls) and publicly supported activity spaces (e.g., recreational centres, libraries and schools) (Hodgson and Doyle 1977; Hodgson and Suzuki 2003).

Many disciplines have used spatial techniques to study human behaviour and use of space. One approach used by psychologists, sociologists and architectural designers is "room geography" (Jakle, Brunn, and Roseman 1976). This technique uses mapping to study how individuals distribute themselves across a particular space, which has led to various findings about human spatial behaviour and personal boundaries (Aiello 1987). For example, individuals searching for a place to sit in a library will first try to find an empty table, sitting as far away as possible from other occupants, which creates a certain amount of personal space and privacy. This phenomenon has also been observed in people sitting on public benches, or in public transportation such as buses or trains (Given and Leckie 2003, 371).

Other examples of mapping to understand social behaviours can be found in various disciplines. In sociology, White, Kim and Glick (2005) used census tabulations and multi-dimensional mapping to summarize residential neighbourhood patterns of ethnic groups in Toronto. This study highlighted the value of looking beyond racial or ethnic classifications in understanding ethnic congregation and residential segregation patterns, demonstrating the merit of providing a more meaningful way to understand social distance among groups. In a study related to human ecology, health and conservation biology, Wallace and Wallace (1997) used a simple spatial model to look at the possible causes of outbreak of tuberculosis including the effects of recurring social, political, economic, and other types of catastrophes which may have triggered the disease outbreaks. In a study of human organization, Smith et al. (2003) established map-based native community information systems as a foundation for future land use planning in Peru's indigenous territories. The authors describe two cases where the mapping and gathering techniques were put to use to delimit a proposed communal reserve to protect resources vital to the survival of twenty-three communities in a large area of the northern Amazon, while also reaffirming historical and cultural links of indigenous peoples to territory lost to colonists over the past century. All of these studies use spatial techniques to better understand the ways that people are using space to be able to better understand, plan, organize and ameliorate these areas, and the goals of spatial studies are no different in research of space in library and information studies.

Space Studies in Library and Information Studies

For understanding spaces, numerous methods have been popular in space planning for libraries. To accomplish the goal of properly and efficiently managing space, the library needs tools that allow for detailed understanding of various options when using new spaces or arranging existing stacks, reading areas and information workstations. Changes in library spaces in the past have involved trial and error (a good approach for small changes, but difficult with the increase of wired workstations), or sketching out floor plans and small cut-to-scale paper models which are based on printed building maps or blueprints (Fuller and Post 1991; Xia 2004b). By reassembling the elements of the library on floor maps or building sketches, a space plan can be worked out. However, these space management techniques are tedious, time consuming and often clumsy.

When space organization is planned, librarians will also often investigate through getting feedback from interviews and questionnaires from library users, or will seek to discover patron behaviour through personal observation in order to analyze the use of physical space and facilities (Hall 1978; Potthoff et al. 2000; Xia 2004b). These data, which are usually summarized by statistical analysis, form the basis for librarians to make decisions about space considerations. Potthoff and colleagues (2000) followed a role repertory grid procedure (derived from psychological methodology for working with urban planning), to collect scientific data on patron perceptions of space. Hall (1978), attempted to use a spatial relationship approach to analyze library patron behaviour of library users against "bubble diagrams". Given and Leckie (2003) discuss the time-space mapping method, where individuals are followed through library spaces and their activities mapped over the course of a day or week. This approach provides librarians with a sense of which areas of the library are heavily used, which pieces of furniture obstruct people's movements through space, where to place information technologies, why certain areas are preferred by patrons for reading and studying, and which areas the library should designate spaces of "quiet" studying. However, although potentially very useful, this method is labour intensive and possible with only a small number of people (383).

Using technology to Help Re-organize and Plan Spaces in Libraries

The majority of academic libraries do not have an automated space management systems in their daily operations (Xia 2004b, 377). The incorporation of computer technology into space management has been taken on by some public libraries. The benefitsof computerized models have been outlined by Fuller and Post (1991), and more recently by Bazillion and Braun (2001), who discuss the benefits of computer visualization in library planning. These authors highlight how computer visualization is a good tool to better understand how floor plans can be modified to account for new or desired changes to a library, and how this can be beneficial for long term planning and collection management. The use of a computerized model of library facilities made an instant simulation of space change possible, and space planning became a considerably less time consuming and more precise proposal (Fuller and Post 1991, 172).

Computer-aided design (CAD) has been used as a space management tool for some libraries. CAD has the ability to draw objects, and is capable of creating three-dimensional views of library objects and structures, therefore enhancing the planning visualization and enabling people to "experience" the space in which they will work (Xia 2004b; Bazillion and Braun 2001). The Michigan State University main library has implemented a CAD system to aid in space management (Haka and Hensley 2003). They believe that this implementation provides a possibility of measuring and calculating the utilization of library spaces and facilities so that the impact of various space allocation decisions on library activity can be assessed. However, only a few university libraries have invested in computerized systems for their space management, as the concept of digitization of this aspect of facility planning is relatively new in the library world.

Geographic Information Systems and Data Visualization

Geographic information systems have been described as computer-based systems providing for the input, storage and retrieval, manipulation and analysis, and output of geographically based data (Ottensmann 1997, 26). Geographically based data refer not only to the physical features that can be found on a map, but also to additional non-spatial attribute information associated with those features. A powerful capability of GIS is to produce a wide variety of maps for different purposes, but it can also do far more than produce maps. The essence of GIS lies in the ability to manipulate and analyze both the spatial and attribute data to produce new information.

MacEachren (1994) defines geographic visualization as a private activity that facilitates exploring unknowns in a highly interactive environment, as opposed to the use of maps as a tool to communicate 'knowns' to a public audience. Further, he notes that 'interactive' computer tools expand the possibilities of the interaction with maps and thus the possibilities to facilitate visual thinking, perhaps in qualitative as well as quantitative ways (8). Knigge and Cope (2006) suggest that data exploration, initial data analysis and visualization using GIS can be employed to facilitate an 'iterative process' in the analysis of data where researchers can explore data to identify themes and processes, raise new questions, and begin to build theories. Humanities computing scholars work toward better understanding of theories to support how visualization can help people to understand what they see, and the effects of visualization of understanding of information. Overall, visualization techniques allow users to explore, interpret and integrate data to provide a rich and flexible medium for data exploration.

GIS have been used in various disciplines for studying many topics with a geographical or spatial nature. In geography, Hodgson and Doyle (1977) used location-allocation to determine the most accessible child day care locations for those citizens of Edmonton, Canada needing to take public transit. The authors were able to use GIS to find optimal locations for day care facilities, which had implications for improvements for more accessible public facilities. In Native Studies, Erik Ellehoj and Frank Tough used GIS to map out Métis surnames to discover patterns of past migration of Métis families in Canada (University of Alberta 2006). In urban planning, Kong and Nakagoshi (2006) used a new method using GIS for quantifying and capturing changes in green spaces usage patterns in China, enabling the government to plan and optimize green spaces in urban development. In a study that combines history and geography or MacDonald and Black (2000) used GIS methods to analyze the history of the book and print culture. In a study that involves environmental studies, geography, and the justice system, Pain, MacFarlane and Turner (2006) used GIS to identify locations that were in need of new street lighting. Here, the authors used hotspot maps and lighting coverage maps to analyze potential areas where crime and street lighting may be linked. Qualitative techniques were also used to explore local residents' perceptions and understandings of the relationship between street lighting, victimization and fear of crime, which were then used to interpret the hotspot maps further and to inform the location and type of possible street lighting interventions. A study by Hassan, Atkins and Dunn (2003) used GIS to explore the spatial pattern of arsenic concentrations in groundwater for analyzing and mapping problem regions and risk zones, which had important implications for health and urban planning.

The use of GIS to visualize and analyze spaces is a relatively new analysis tool in the field of social sciences and humanities. While maps have been used in understanding, visualizing and communicating spatial data for centuries (by cartographers and geographers who relied on the power of the human eye to detect patterns and concepts), GIS and other developments in data exploration have changed the way that we store, analyze, and display spatial data (Knigge and Cope 2006). These new methods have generated ways for exploring and visualizing data that were never before possible. According to Kwan (2000), GIS and visualization techniques can greatly facilitate the exploratory analysis of spatial data, and in light of these new tools, it has become possible to overcome many of the limitations on traditional methods in the study of human spatial behaviour (89). Granados (2003) used GIS visualization to map out the enrolment of students at universities, and according to this author, previously researchers have relied heavily on the use of tables and graphs to analyze data. However, in dealing with information that has a spatial component (such as enrolment data), Granados believes that this is insufficient for communicating the spatial dimension, and that an effective way to add this extra information is through maps, since "many spatial patterns are easier to identify and understand" (2003, 25). The use of GIS, often used in geography and other sciences for spatial analysis, has only recently been attempted in the field of Library and Information Studies for studies of library spaces and activities.

The use of GIS in Library and Information Studies

GIS has been used to assist in the visualization and management of building spaces and facilities in recent years. This technology has the ability to provide libraries with the power to analyze patterns of library utilization in ways that were once impractical and expensive. With powerful capabilities for presenting data in a visual format, and also analyzing spatial relationships, GIS has gained popularity in research and practice.

Recently, GIS has been used for the analysis of library utilization in service areas, and for the planning and management of library services. Koontz (2005) and Preiser and Wang (2006) used GIS technology as a tool to evaluate library and patron locations, with GIS used to estimate the size and characteristics of populations in library service areas. Koontz used GIS to identify relevant population characteristics of the library branch's market area (in conjunction with census data) to discover local library use which enabled libraries using this tool to better plan services and new library facilities. Preiser and Wang (2006) used GIS to create a master plan for the Public Library of Cincinnati and Hamilton County in the United States. The project assigned comprehensive scores for each of the libraries and grouped them into groups of high, medium and low performing libraries (rankings based on staff survey, facility evaluation, service area, usage, building, site, and capacity). The outcomes of the project were recommendations and projections for branch libraries in the county. These studies provided library decision makers with a spatial view of the library's market area and branches, and a better and more complete understanding of the library's user potential and future population.

Software such as *Library Decision* has also been used in libraries to fulfill the tasks of analyzing the needs of patrons and staff. These types of GIS software packages are able to associate library statistical data with geographical locations of communities, so that the distribution patterns of library users can be displayed visually on maps. This type of analysis is beneficial for the planning of services and to visually demonstrate areas where a library could be needed, and can provide a more complete understanding of the library's user population and even patron needs for specific services or library hours (Dorman 2002).

Inside the library, few studies have made use of GIS analysis. Xia (2004a) describes the use of a GIS to monitor which books have been pulled off the shelves by readers in the library, discarded and then re-shelved by librarians. It was discovered that collection adjustments could be made, especially where books from prominent shelves were seldom pulled out (Xia 2004a). This project may have helped to explain the habits of library patrons browsing materials, and could be very useful for collection and space planning in the library.

Given and Leckie (2003), discuss how "spatial data analysis is a useful method for mapping the physical layout of libraries, to examine ways that people make use of that space" (366). Spatial analysis and management tools such as GIS can be a useful tool for better understanding how spaces are being used by library patrons. Xia (2005) proposes the use of GIS as a useful tool for visualizing and analyzing potential changes that could be made inside library settings. According to Xia (2004b), the advantages of GIS technology over existing space management tools are the following:

- GIS has the ability of performing spatial analysis, a key that makes measurement of the usage of library space and facilities easy;
- The GIS database is able to store data related to each object and link that data to the visual presentation of the object – spatial analysis and presentation become the same system;

- GIS can perform infrastructure management at a very detailed level (a room, a desk or a chair), and floor plans and building drawing sketches can be easily navigated, as well as printed or used for presentation to decision makers;
- Using a GIS for design and planning costs almost nothing since most academic libraries already have popular GIS software (378).

It is these advantages that make the use of GIS a valuable option for spatial analysis in a library setting. Although the creation of the databases behind the system can be time consuming to create, GIS is a valuable option for many library planners. The technology is designed to manipulate geo-spatial data, while information regarding library space, and the occupancy of those spaces, is geospatial in nature because it deals with locations, and the location of people within areas.

Xia (2004b) used this type of analysis by drawing facilities in libraries (such as chairs, tables, shelves etc.) on maps using GIS and then creating geospatial information and connecting these databases to map features. Analyzing patterns through the GIS software can show the changes to specific areas, and the effect on spaces within the library, and therefore effects on library patrons. Xia (2005) also performed an experimental study using GIS by observing the occupancy of study areas in a library with the aim of evaluating the efficiency of library study resources usage. He performed this through the construction of complicated and detailed databases, including even the sizes of shelves and bookcases. This research demonstrated the potential of GIS for assisting library operations with regard to study space management, and examined the idea of using GIS as an automation tool to record the daily activities of libraries. These maps of study areas were used for a better understanding of patterns and usage of library facilities. In contradiction to the findings of earlier studies (e.g., Cohen and Cohen 1979), in this study, Xia found that tables were more popular than study carrels in every area studied, and that those tables that were equipped with electrical and Internet sockets were among the busiest (227). Xia also found that the evening was the peak time for students to study in the library, and that fewer users appeared to be using the library in the afternoon. In addition to this, the study showed that library tables, when occupied, left a number of spaces open that were considered by the author to be considered a wasted resource. Group study rooms were also heavily utilized, but also considered to be a wasted resource by the author due to the fact that study rooms were not always fully occupied (e.g., three out of six chairs at a table in a group study room).

However, the method used in Xia's study was somewhat time-consuming, as information was collected at three levels: the floor level (the total study area divided into study segments according to the physical location the segment level (information as the number and type of study facilities within the segment); and the facility level (separated into different types of study facilities such as carrels, tables, chairs etc.). Also, information was collected and analyzed about the dimensions, location, condition, raw materials of different furnishings and seating. In addition, this study only included a small portion of the total library area, although why this area was chosen is not made clear by the author. In addition, the techniques used i[illegible] were not triangulated with other methods and used only the observational [illegible]on and GIS analysis.

GIS applications provide great flexibility for [illegible]ysis of spatial data, as it is possible to compare the occupancy of spaces over different time periods (e.g., morning to afternoon; regular semester week versus exam week). The results of analyses with technical tools can be used for both short-term and long-term planning and re-designing of spaces within the library. GIS has recently been used by other disciplines for mapping people in spaces, but very little has been done with mapping out how students and other patrons use spaces within an entire academic library. The purpose of this study is to use GIS to better understand the usage of a small academic library, to visualize the activities of patrons, and to achieve better understanding about some of the space issues and problems, which can be achieved through the use of this analysis technique. The ability for GIS maps to demonstrate visual evidence of these problems and areas of high usage is the most important aspect of using this technique in a library setting. By creating visual maps that may be used to help better design areas and spaces in libraries, GIS is the best tool for creating the visual proof needed to make changes and influence decision makers on the topic of changes to the Winspear and other small library spaces.

Chapter 3

Methods

Introduction

This study used two different methods to ensure that a holistic understanding of typical activities in the library was achieved. The study used observational sweeps analyzed using Geographic Information System (GIS) software, to visualize library activities and usage, as well as questionnaires to discover patrons' opinions, preferences and issues with the library spaces. The use of these combined methods can help library planners and decision makers to better understand patrons' needs and design the best possible library spaces. Often, whenever changes in library spaces have been carried out, planning has been undertaken by relying on casual observations of librarians or by surveys of library users. Library studies tend to rely on literature reviews, interviews, and questionnaires but rarely used more than one technique or address questions about the validity of respondent reports (Potthoff, Weis, Montanelli and Murbach 2000). Furthermore, many methods of collecting and analyzing data used by geographers and social scientists in terms of people's use of spaces are not well used in the field of library and information studies. In this study, the researcher used similar methods and tools to those used for mapping and visualizing populations in other fields (e.g., Human Ecology, Earth and Atmospheric Science). Additionally, as these techniques are rarely used in small, confined spaces (such as the library in question), one of the goals of the project was to test the utility of these tools and techniques for library and information studies research.

However, for this study it was important that the data that were collected not be limited to what the patrons of the library were observed to be doing in the spaces, but also what they thought of the spaces. Nardi and O'Day (1999) discuss how by adopting holistic views of users' library-based interactions, researchers and librarians can best decide what changes users require in library spaces, as well as the effects of technology in the library environment. Sadler and Given (2007) use this approach to examine the holistic role of the academic library – where systems and users interact within a larger social framework. Although digital resources play an important role in students' academic lives, focusing on these and excluding other areas of interaction risks overlooking significant elements of the library experience (Sadler and Given 2007, 116). Through a holistic understanding of the ways that individuals use library spaces by using a triangulation of methods, including observational sweeps, GIS analysis and patron questionnaires, well-rounded insights into the activities and uses of the spaces in the library can be achieved.

Research Ethics

This study went through the University of Alberta ethics review process (through the Faculty of Education). Details of the ethics application included the study research questions, a brief literature review, a description of the methods, and a description of how human subjects were to be used in the research. For the purpose of this study, ethics clearance was needed for both the observational seating sweeps and questionnaire portions of the study. The steps taken by the researcher to ensure confidentiality and protection of privacy were described, such as how the observations were to be conducted unobtrusively to gather data in a natural setting without influencing the individuals in the spaces. Details were also given regarding how details of the project would be provided to any individuals who might approach the researcher, and would have the option to leave the space at any point of their own accord. Individuals were not identified in the study, nor asked to provide any personal information, and a description of the focus and issues surrounding privacy and confidentiality for the study were provided in detail in the ethics application.

Unobtrusive Observation “Seating Sweeps” Method

To answer the questions of how people use space in a library setting, unobtrusive observation studies have been conducted by a number of researchers (e.g., Spradley 1980; Leckie and Hopkins 2002; McKechnie et al. 2004). In their investigation of public libraries in Vancouver and Toronto Leckie and Hopkins (2002) report the various uses of spaces by library patrons. McKechnie et al. (2004) also describe the use of this method to capture the naturally occurring behaviour of library users, observing such behaviour as reading, studying, and using computers. The goal of unobtrusive research is that it attempts to study human actions and preferences without the act causing them to change or misreport those actions or preferences (Eldredge 2004). Generally, this research method recognizes the possibility that people will behave differently if they know that they are part of a research study. In this study, observational seating sweeps were used to answer research question number 1: Who is using the spaces in the library and how are they using these spaces? (See Chapter 1). Seating sweeps (as developed by Given and Leckie 2003), are a valuable method to see what patrons are really doing within a library space. Individuals may describe particular activities or express concerns on a written questionnaire (e.g., saying that the library is "always busy"), but observed behaviours can provide concrete evidence of actual patron activities. As well as providing descriptions of who library patrons are and what they are doing, seating sweeps point out the diversity of patron behaviours and activities in libraries that may conflict with rules and regulations libraries have traditionally set. This evidence can be valuable to support changes in library design or policy decisions (Given and Leckie 2003). In addition, seating sweeps are preferable to other methods (e.g., questionnaires), in that patrons may not describe actual activities that they believe may be frowned upon by the researcher or librarians (e.g., eating and drinking). Given and Leckie (2003), note that although observational studies can provide a glimpse of "what" is happening in libraries, this method does not indicate "why" patrons do what they do (383). Therefore researchers must assess questions of "why" through the triangulation of other methods to better understand patron attitudes and motivations, such as the use of the questionnaire that was used in this study.

Following the process outlined by Given and Leckie (2003), preparation for the observational sweeps began with the creation of a "seating sweeps observational checklist" (see Appendix A). This checklist listed all of the attributes and characteristics that needed to be captured by the observations to ensure a well-rounded view of patrons' possessions and activities. Next, a spreadsheet for the data collection was created in *Excel*, which could be uploaded to the PDA used here for data gathering. The spreadsheet included estimated general demographics of the observed patrons (e.g., age and gender), as well as patron possessions (e.g., food and drink) and activities (e.g., reading) (see Appendix A for data collection checklist). The spreadsheet was set up in rows where gender, age, possessions and activities were each in a separate category. An additional row for "other" was also added to the possessions and activities to ensure that those that were not included in the pre-set categories were also recorded.

This method consisted of observational walks (or sweeps) through the public areas of the Winspear library. Data collection for this study took place over two days in each of the third weeks of September, October and November of the Fall academic term in 2006. December was not chosen due to the short length and the fact that the majority of the month is during the student exam period. Sweeps were conducted three times a day at different intervals starting at exactly 8:30 am, 12:00 pm, 4:00 pm, to achieve reliability within the study and to get a glimpse of the ongoing activities across the hours of the day. The sweeps were conducted on the two floors of the Winspear Business Reference library at the University of Alberta, including the circulation and reference areas, book stacks, computer terminals, the group study rooms, work tables and study carrels and any other areas that patrons use (see figure 2, Chapter 1).

The observations were taken in the same direction and order each time each to ensure reliability of the observational method. These seating sweeps were designed to capture naturalistic data such as who was using the library (e.g., gender); the activities in which they were engaged (e.g., using the computer workstations); and, the library location in which these activities occurred (e.g., group study room number one). In addition, data were collected on the possessions of library patrons (e.g., food/drink, laptop, cell phone etc.). Data were needed to get a clear picture of spaces being occupied in the library, general demographic information about the library patrons, and what type of activities were taking place in particular areas of the space. Data regarding the possessions of the occupants were also collected to help further understand the activities and needs of the library patrons.

Data Collection Procedures – Observational Data

Observational 'Sweeps' in this Study Using a PDA

For this study, data were recorded in a PDA with an *Excel* spreadsheet three times a day during the data collection period. To collect the sweeps data, a PDA (Personal Digital Assistant) was used. There is nothing new about using computer technology for data collection in field research; small, handheld devices have been used since the late 1980s (Hecht 1997). However, a number of factors seem to be driving increased use of handheld computers for research, such as decreased cost of these devices, increased functionality, and a reduced size; these are all traits of the latest in technological advances. PDAs have been adopted and used within many disciplines for a number of different purposes, such as decision support, education, and accessing or collecting data. For example, PDAs have been largely adopted in healthcare for data collection and information organization, including: real time tracking of data related to diseases or conditions; computerized patient records, which are an efficient means for organizing medical data; and, physician use of PDAs to access data, reports or images (Kuziemsky, Laul and Leung 2005, 338). One of the best features about the PDA is the ability to use common software (i.e., *Microsoft Excel*), that is compliant with traditional Personal Computer applications, making it an indispensable productivity tool, which can be used for word processing, spreadsheets, sending and receiving e-mail, downloading information from the Internet and giving presentations.

In a study to discover which method of data collection was the quickest and most efficient (i.e., PDA compared to pencil and paper technique), using a PDA was found to be the fastest and most accurate of the methods in moving the data from the field to the computer (Hecht 1997, 8). The PDA was also the smallest and easiest to carry and the least obtrusive to participants. However, the method does require some investment in time to learn the software and techniques for using the PDA efficiently. According to the study by Hecht (1997), the PDA is well suited to be used "where easy researcher mobility, a high degree of data transfer accuracy, and not too large a sample is being utilized" (Hecht 1997, 9). PDAs have been used extensively in the medical field to speed up the process of data collection and analysis. According to Jao, Hier and Su (2003) PDAs offer an opportunity to automate data collection and then upload this data into departmental databases for analysis and reporting purposes. This offers researchers the opportunity of facilitating and making tabulation and analysis of data much less time consuming than paper based methods.

More recently, Given (2005) has used a PDA to collect observational data on patrons in a large academic library setting. This technique was seen to be an easy way of collecting data, and efficient in that it automated the data entry step. This study was meant to make use of this innovative technique, but in a smaller scale than the Given 2005 information spaces study, and in a different setting. For this study each spreadsheet represented a different time and day, and a sweep number was used to keep track of which day the data were collected. A small map of the library was placed inside the PDA for easy reference to the area codes and locations. The different locations of the library were coded A-P (i.e., Area 'A' being the circulation desk, area 'G' being the work tables on the first floor, see Figure 1, Chapter 1). Each row in the spreadsheet represented a different individual occupying a particular area or seat, and the presence of particular possessions or activities for each individual were coded with a '1' in the spreadsheet. Information entered into the PDA was automatically transferred to an *Excel* sheet on the host personal computer when the unit was synchronized through a USB cable.

Pre-Testing of the 'Sweeps' Technique

Data were gathered using a Personal Digital Assistant (PDA) with the *Excel* spreadsheets created by the researcher before the formal data collection took place. A pre-test of the sweeps was done to ensure that all of the categories of behaviours, possessions and locations were covered in the formal data collection. During this pre-test of the method, the researcher brought the map of the library and codes for the research, to ensure that nothing was missing. This was a valuable exercise, as the researcher was able to discover a few problems with the spreadsheet, which may not have been otherwise caught. For example, a missing category – "cell phone" in the 'possessions' section of the data collection section of the *Excel* sheet (see Appendix A) was found, which was important, as an understanding of patrons' use of technologies was one of the goals of the project. One of the issues discovered was the importance of capturing the data and occupancy of the patrons of the library always from the same cardinal direction (starting North where patrons were seated at a tables), to be sure that the collected data were constant and reliable. This procedure was key to ensuring that the occupancy of the library spaces was clearly and reliably documented, so that later on in the GIS analysis there would be no confusion about what area or what specific seat that patrons were occupying during a particular observational session. One of the main goals of the study was to see which areas and seating had the highest rate of use by library patrons, and without this careful recording of specific places of occupancy, this useful information would have been lost.

Patron Privacy in Observational 'Sweeps'

Given and Leckie (2003), discuss how steps may be required to assure library patrons that their privacy is being upheld when conducting observational research. The method used here similarly did not identify specific library patrons, and at no time was the questionnaire connected to the results of the sweeps in a way that could identify individuals. Strategies for minimizing researcher effect included the use of a PDA (as opposed to traditional pencil and paper observations), completing the checklist while hidden from view, appearing to look elsewhere in the room, and completing the checklist while seated at an empty table. The goal was to have the researcher blend in with the library surroundings and unobtrusively document events occurring in the space (Given and Leckie 2003, 377). During the entire term of data collection, the researcher was only approached twice by library patrons in regard to the nature of the researcher's activities. When asked what the researcher was doing, a full explanation and demonstration of the type of data that were being collected was shown to these curious library patrons.

Manipulation of Excel Spreadsheet Data

After the sweeps were finished, the *Excel* sheets were manipulated so that they could easily be analyzed and imported into the GIS (saved as database files). This included adding zeros into all of the cells in the spreadsheet that represented the locations where there was no occupancy. This was important, as places that were not used or occupied were equally as valuable to examine as those that were occupied. An understanding of places of heavy or light usage in this library are key to help library planners and decision makers to make changes to this library, which was one of the goals of the study. Other changes to the spreadsheet included adding an "occupied" column to distinguish the occupied rows from those that were unoccupied. Identification numbers were also created to match the polygons that were later created in the GIS, which enabled the information from the sweeps to be linked to the visual areas in the digital map. Polygons are areas that are fully encompassed by a series of connected lines, and each contains one type of data (e.g., occupancy). Data were exported into database formats to be ready for use in the GIS.

Data Analysis – Observational Data

Descriptive statistics were run on the observational data to describe the findings from the observational "sweeps". Nardi (2006) notes that by doing a descriptive analysis of the variables, a profile of study subjects can be measured. Analysis of the findings included running descriptive statistics using *Excel*, such as frequency distributions, graphs, and statistical measures. Findings were analyzed using frequencies (e.g., raw numbers), which were then turned into percentages for better understanding of proportions and trends. When applicable, findings were represented visually through a graph or chart (see Chapter 4).

Data Analysis – GIS Mapping of Library Occupancy

Spatial data analysis is a useful way of mapping the physical layout of libraries, to examine the ways that people make use of spaces. The use of GIS technology in spatial data analysis and visualization is a new concept in library space management. In the case of using this technology to map patron use of space in an academic library, very little has been done. GIS are not the ultimate analytic tool for every situation, but the usefulness of developing spatial spreadsheets from observational research, the value of visual analysis and presentation, and the low cost of implementation make the technology applicable to many libraries and researchers. In addition, the GIS analysis method of this study was not something that has been frequently used for such a small space. Generally, this technique is reserved for data from larger populations and samples. However, this technology, when combined with spatial data, can lead to new levels of understanding that enhance the ability for academic libraries to provide services and useful design; in turn, this can help students in academic libraries to fulfill their information seeking and academic goals.

For this study, the *Excel* sweeps files were imported into the GIS for visualization of those data, a step that could not have been achieved through a spreadsheet or statistical software program alone. This involved first recording the rate of occupancy of each area (or each carrel/table/chair) at designated intervals, which was gathered through the observational sweeps. GIS technology is designed to manipulate geospatial data; the data dealing with the occupancy and spaces in the Winspear is geospatial in nature, because it deals with locations. Spaces in the Winspear are presented in map form (see Figure 2, Chapter 1), to show the floor plans and furniture layouts in a visual way. This map was created from paper versions that were borrowed from the head librarian of the Winspear Library. The paper maps were scanned and touched up using a simple drawing program (Microsoft Paint). This was an important process, as the paper maps were somewhat outdated, so they needed to be adjusted to reflect the current state of the Winspear, as it has undergone many changes (e.g., increased number of computer terminals; reductions in spaces for physical collections). The new map was then imported as a bitmap file format into the GIS software.

For this project *ArcGIS* software was used. Generally, a GIS is a technology that is used to view and analyze data from a geographic perspective. ArcGIS provides a collection of software products that create, edit, import, map, query, analyze, and publish geographic information (Environmental Systems Research Institute 2006). ArcGIS software is considered to be the leader in Geographic Information Systems, and is the software that is commonly used on the University of Alberta campus in such departments as earth and atmospheric sciences, agriculture, forestry, biology, and humanities computing, and in other special access labs around campus.

ArcGIS software was used to create polygon shape files, which were created to imitate the areas of the Winspear, and corresponded to the data collected from the sweeps areas. Area segments were drawn as polygons to imitate their actual shape (e.g., the polygon of a work tables created in a rectangular form that matched the proportions of the Winspear – see Figure 2, Chapter 1). Additional polygons were also created to imitate the seating in the Winspear. Therefore, the floor maps provided an overall look of the spaces, while the information could be linked to the shapes of the various areas and seating to give information about the occupancy and activities occurring in those spaces.

The visual presentation of objects or values from the sweeps were distinguished by the use of colors to show higher values (e.g., 15 people over the semester using a laptop in a particular seat was shown in a dark colour to show that this was a place of high occupancy), or clustering of occupants in the spaces in the library (e.g., high numbers of patrons talking in a particular area throughout the semester). See Chapter 4 for details.

The data that were entered into the spreadsheet database for use in the GIS were analyzed and visualized to produce visual maps of what areas are being used, and for what purpose, in this setting. The analysis focused on where people were using spaces, the occupancy and use of the spaces by different genders, where people were using laptops, and the rate of occupancy for computer terminals. Also, other activities, such as talking, sleeping, and the possession of food and drink, were identified. Given the large amount of data collected in this project, this study focuses on patron use of space, and how technology is being used by patrons in the library, to answer research question number 3: How and what kinds of technologies are being used in these spaces (see Chapter 1). ArcGIS was used to manipulate and visualize the data to show patterns and images of use, which would not have been available through just and examination of statistics of the spaces in other types of software, and was used to answer research question number 4: How can we make use of new technologies for data collection and analysis to better understand and visualize the use of spaces and occupancy in this library; and number 5: Is the use of a GIS an appropriate tool to visualize the use of small library spaces (see Chapter 1).

Library Patron Questionnaires

Cromley (1999) discusses how conventional mapping needs to be combined with other methodologies (e.g., observations or surveys), to properly explore the details of the space being studied. In addition, when doing a study of how residential groups form attachments to places and shapes of neighbourhoods to reflect their identity, social practices and sense of community, Knigge and Cope (2006) realized that looking at only quantative data (by census data used in the GIS), would not provide a complete picture of the neighbourhood. In fact, the authors noted that GIS and visualization alone could not reveal trends and interesting findings in community-based activities (Krigger and Cope 2006, 2033).

Libraries regularly use survey methods to measure service quality (Heyden et al. 2005), and analysis of space problems are among the many reasons to conduct a survey (King 2005). According to Booth (2003), questionnaires are the most common research instrument that librarians encounter in their day-to-day practice, and they remain the best way of finding out what is happening in libraries and how people are responding to them. Bookstein (1985) notes that the reasons for the questionnaire's popularity could be due to its simplicity or the naturalness of asking questions when information is desired, as well as the straightforward formalization of the process (24). King (2005) outlines how survey questionnaires are often the best choice for an economical method to reach a large number of people with a large number of questions. A search through the scholarly research shows the use of patron questionnaires in many libraries. An example is a recent LibQual study (Jankowska, Hertel and Young 2006), which discusses how the questionnaire results helped the library to define its strengths and weaknesses; the authors note that survey and assessment tools have become a part of the academic library's ongoing planning process. In addition, the authors noted that user feedback could be effectively used to improve the quality of the library services and design space to meet user needs. The questionnaire is typical of the types of research tools used by libraries to get a better understanding of patron activities in the library.

In the case of this study, questionnaires were chosen by the researcher to provide triangulation of the data, as well as to answer research question number 2: What are the patrons' preferences, attitudes and issues regarding the spaces in the library? This was considered to be an important aspect of the study to better understand the spaces from the patrons' point of view. According to Nardi (2006), self administered questionnaires are best designed for investigating attitudes and opinions that are not usually observable (67), as well as efficient tools for surveying large samples of respondents in a short period of time. One of the goals of this study was to examine patron preferences, attitudes and issues regarding the spaces in the library (research question #2), and therefore a questionnaire was used as a way to survey a number of library patrons. This method provided insight into the demographics and the background of the library patrons, their needs and their preferred spaces within the space, and served as a useful compliment to the observational data gathered.

Data Collection - Questionnaires

Pre-testing of Questionnaires

Pre-testing was undertaken for both content and layout of the questionnaire, and to ensure the absence of jargon or unclear terms. In total, the questionnaire was pre-tested with 5 undergraduate and graduate students, one staff member from the library, and one outside participant who works at a university, and often makes use of university libraries. The pre-testers made a number of valuable observations for improvement of the questionnaire (such as comments about facilities in the library) and checked for content validity. Five different participants from different fields of study and age groups were used to test the questionnaire and told to consider the questionnaire in the context of the library that they use the most. In addition, the survey was revised and reviewed a number of times by an advisor with a great deal of survey methodology expertise.

In addition, the procedures for the questionnaire were tested beforehand. This ensured that the process during the survey period would go smoothly, and to catch any problems before full implementation. This was a useful exercise in changing some of the procedures and questions, as well as giving confidence to the researcher, and reliability to the method. The questionnaire coding procedures were at this time also decided to ensure that the later analysis would run smoothly.

Patron Questionnaire

The questionnaire (see Appendix B) consisted of nineteen questions, and was distributed at the door of the entrance to the library over a period of two full days from the library's opening (8:30am on Thursday, and 11:00 am on Sunday) to closing (10:00pm), in the middle of term. Thursday and Sunday of the week were chosen to get a sample from a weekday and weekend day, and according to the library staff at the Winspear were often the two most popular days of the week. The questionnaire consisted of an introduction to educate the audience about the purpose of the survey, details of how the results of the survey were to be used, and assurance that confidentiality would be maintained. The questions were grouped into areas that measured similar concepts (such as laptop use, and thoughts on particular spaces). Nardi (2006) describes how it is less likely that researchers will affect the outcome of a self-administered survey when respondents read items on their own, rather than, for example a face-to-face interview. This allows for more standardization of the questions and increased reliability because the researcher is not influencing the responses (68). In this study, patrons were given the option of filling out the questionnaire and bringing it back on their way out of the library. The patrons seemed to be more receptive to completing the survey while in the Winspear, rather than in front of the researcher, so many took it into the library with them, filled it out at their leisure, and returned it when they were leaving the library.

The researcher sat at a table outside of the Winspear Library to distribute the questionnaires, and sealed boxes were located at the circulation desk and exit for patrons to return the completed questionnaires. Individuals were not identified on the questionnaire. King (2005) and Leedy and Ormrod (2001) provide numerous guidelines to ensure a short, clear and focused survey method. According to King (2005), face-to-face encounters allow the surveyor greater control in assuring a respectable rate of response because the surveyor may stop as many people as necessary to get a sufficient number of responses. This was the case in this study, as the rate of return was quite high. In total 354 surveys were distributed, and 322 returned, with a return rate of 91%. The researcher also did periodic sweeps through the Winspear to collect any discarded questionnaires, which were destroyed.

Data Analysis - Questionnaire

The data gathered from the questionnaire were entered into *Excel* software that had the ability to perform descriptive statistics. Each survey was given a unique number, and each question was coded and the information put into the spreadsheet. Several techniques were used to analyze the survey data, including tabulation of the frequency of different responses and calculation of percentages, as well as comparison of the responses from different groups (e.g., gender or departments), and analysis of trends (King 2005). Percentages were calculated in terms of both the total number of questionnaires coded, and the total number of those actually having responded to the question (the valid percentages).

The methods in this study were triangulated to ensure a holistic view of the experiences of library patrons. These methods included observational 'seating sweeps', GIS visualization and patron questionnaires. The methods used in this study were designed to answer all of the research questions in Chapter 1. Through these procedures, a well-rounded view and picture of a typical day in the library was achieved, and problems with the space and design of these library spaces were brought to light.

CHAPTER 4

Results and Discussion

Introduction

This study examined patrons' usage of and opinions about spaces in a small academic library. Academic libraries are undergoing an evolution in terms of the way that spaces are being used; it is important that we study library spaces to get a better understanding of what is going on in these spaces, and how they might be better designed to suit the needs of the users. This study has implications for library design and planning, and makes use of a number of methods to ensure that a holistic view of the Winspear is being achieved. In the past, various ways to understand patron activities have been used in libraries, such as questionnaires or population counts. This study used 'seating sweeps' to gather observational data, analysed those data with a GIS, and also used patron questionnaires. Through the use of these techniques, a clear understanding of patrons' activities, possessions, needs and opinions was achieved, with implications for future space planning and design of this and other libraries.

Observational Sweeps

Occupancy Levels of the Winspear

In general, the month with the highest observed occupancy was October, with a 32.8% occupancy rate (i.e., total number of seats occupied over the total number of possible places that could be occupied) over all the times of day and across days of observations. However, September and November were also busy with occupancy rates of 24.5% and 29.5% respectively. The most dramatic increase in occupancy can be seen when comparing the percentage totals of occupancy throughout the day. Table 1 demonstrates the high usage of this library during the mid-day period, as there were almost twice as many people observed seated in the Winspear during the mid-day as during other longer observed periods. Around noon was certainly the most popular time observed, and many library patrons used the library as a place to work during the noon hour while eating their lunches, or between classes. It was noted that there was an

Total number of seats occupied during the day over the entire observed semester				
Time of Day	*September (N=259)*	*October (N=346)*	*November (N=311)*	*Total (N=916)*
Morning (8:30am-10am)	6.6% (17)	21.4% (74)	18.3% (57)	16.2% (148)
Mid-Day (12pm-2:00pm)	67.6% (175)	51.7% (179)	53.4% (166)	56.7% (520)
Afternoons (4:00pm-5:00pm)	25.8% (67)	26.9% (93)	28.3% (88)	27.1% (248)

Table 1 – Total occupancy of library in times of day observed over the semester. 'N' is the total number of possible places to occupy.

'outflux' of library patrons a few minutes before class times, as well as an influx of other library patrons during this time - making it a very busy place at times, but often clearing out suddenly. It is possible that this sudden influx/outflux is due to students leaving to go to their next classes, or coming from their last one, or going to jobs or other "timed" events. Some patrons noted in the questionnaire that when searching for a preferred place to sit, waiting for the time when there was a lot of movement by students (leaving or coming) was an ideal time for finding a seat.

General Demographics of Observed Library Patrons

The total observed library patrons were almost exactly split equally between males 50.1% (439) and females 49.9% (438). In addition to this, almost all patrons observed were under the age of 29 years old (99.7%), while only 0.3% of the library patrons were estimated to be 30 to sixty years old, and 0% over the age of 60. The ages of library patrons were estimated by the researcher, and categories of 30 and under, 30 to sixty, and over sixty were chosen, as it is very difficult to assign exact ages based on appearance. This technique was used by Given and Leckie (2003), who acknowledged that this is one limitation of this type of study, as the ages of library patrons are estimated, and therefore not accurate reflections of patron ages.

Month/Time of Day	*Male*	*Female*
September (N=260)	44.6% (116)	55.4% (144)
October (N=306)	52.3% (160)	47.7% (146)
November (N=311)	52.4% (163)	47.6% (148)
Mornings (N=148)	54.7% (81)	45.3% (67)
Mid-Day (N=521)	50.5% (263)	49.5% (258)
Afternoons (N=208)	45.7% (95)	54.3% (113)

Table 2 – Percentages of patron genders throughout the semester. Totals for September, October and November, as well as totals for all mornings, mid-day and afternoons.

Month/Time of Day	*Under 30 yrs*	*30-60 yrs*	*Over 60*
September (N=257)	99.6 (256)	0.4 (1)	0.0
October (N=297)	99.6 (296)	0.4 (1)	0.0
November (N=311)	99.6 (310)	0.4 (1)	0.0
Mornings (N=147)	99.3 (146)	0.7 (1)	0.0
Mid-Day (N=511)	99.8 (510)	0.2 (1)	0.0
Afternoons (N=207)	99.5 (206)	0.5 (1)	0.0

Table 3 – Percentages of patron ages throughout the semester. Totals for September, October and November, as well as totals for all mornings, mid-day and afternoons.

The observations showed that the Winspear is largely used by undergraduate students, and the researcher rarely observed anyone who seemed to be of an older age group. The demographic distribution of males and females did not vary more than five percent, even when compared between different months or times of day (see Table 2). Also, the percentages of patrons over the age of 30 were less than 1% throughout the whole term.

General Possessions of Observed Library Patrons

During the observational 'seating sweeps', data were collected on the types of possessions that patrons had with them in the library. Possessions were defined as objects or other things that patrons had with them, including: books, paper, coats, bags, laptops, food/drink, PDAs, calculators, walkman/i-pod, etc. (see Appendix A for complete seating sweeps checklist).

In this library, there was a high percentage of patrons with books and papers (80.8%), as well as bags, knapsacks and coats (92.8%) (see Figure 3). This high number of bags and coats point toward the idea that many students tend to take their possessions with them around campus, as opposed to putting them in a locker or other safe place. In addition, 35.4% of patrons had food or drink with them in the Winspear. The patrons were generally not attempting to hide the fact that they had food and drink, and many of the patrons were observed eating, openly, in the library. This points to some of the changes that have occurred recently in the Winspear's practices around eating and drinking. At the University of Alberta, library policy regarding food and drink in the library changed across all libraries to allow patrons to eat and drink in these spaces (Conversations with library staff at staff meeting, February 2007). Signs posted previously in the Winspear to stop patrons from eating and drinking have recently been removed. This library is now seen by many as a place where patrons may eat their lunches and drink coffee while studying or using library spaces, as opposed to trying to hide their habits from other patrons and library staff.

There was also a large number of students using their laptops in the Winspear throughout the entire term. This number also increased from 15.1% in September to 32.8% in November. This indicates that the use of laptops increases as the semester goes on, likely as students have an increased workload that requires the use of their laptops. Generally, the large number of students who were observed with laptops, cell phones, I-pods, calculators and other various technologies is in keeping with Atkinson and Figueroa's (1997) idea that business students view keeping current with new technologies as being important to maintain a competitive advantage. However, other empirical data are needed to support this claim.

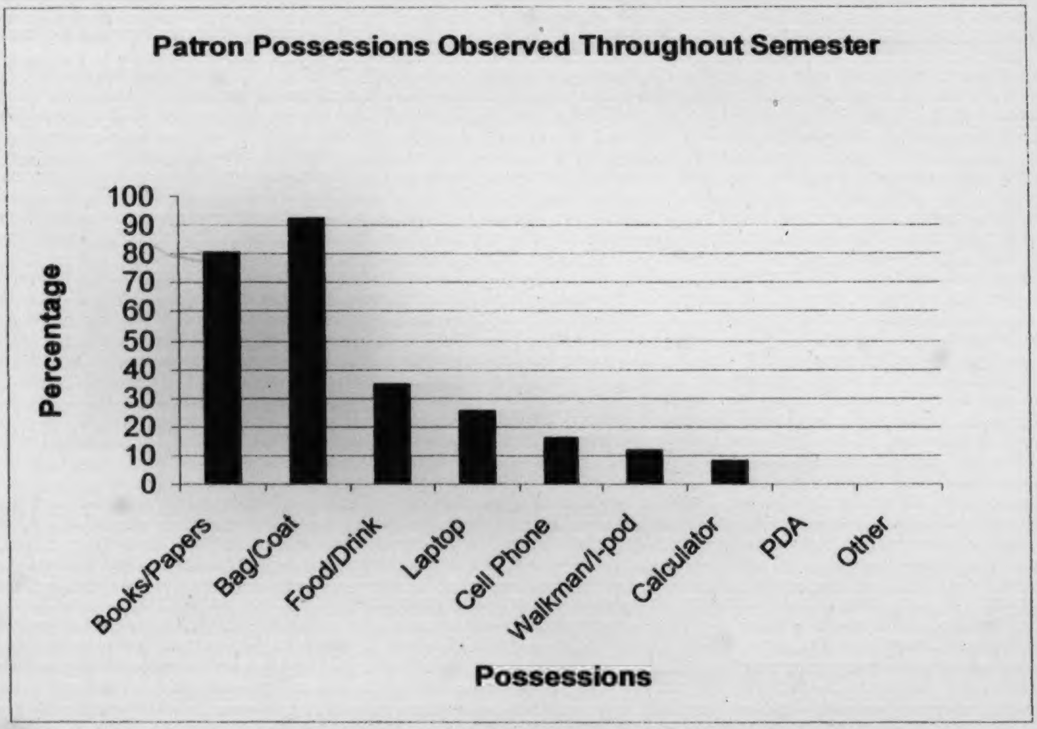


Figure 3 – Total possessions of library patrons observed throughout the semester.

Activities of Library Patrons

Figure 4 demonstrates the variety of activities that were occurring during the observational sweeps. As this is an academic library, many students were engaging in activities that one might expect to see, such as reading and writing (43%). This is comparable to the public library setting, where Leckie and Hopkins (2002) observed that patrons were most frequently engaged in reading (50% and 60% at the two libraries studied) and writing (20% and 21% at the two libraries studied) activities.

However, there were also unexpectedly high numbers for other activities such as laptop use. The use of laptops in this library was at 20%, which was the second highest activity to be taking place after reading and writing at 43%. Laptop use had an even higher percentage than use of the library computers at 15.1%. When comparing this to the public library setting, Leckie and Hopkins (2002) do not even include personal laptop use as one of the major activities observed. However, in their study, using library computers

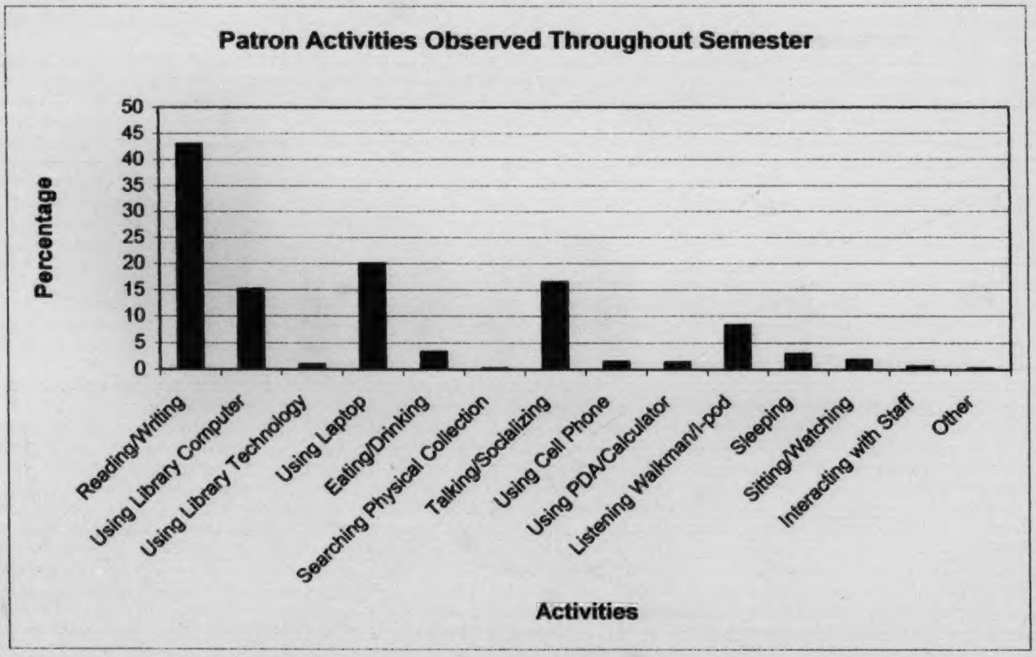


Figure 4 – Total activities of library patrons observed throughout the semester.

was observed at 14% (Toronto) and 13% (Vancouver), which is comparable to the numbers in this study. This could be due to the fact that Leckie and Hopkins completed their work in 1999, as there have been dramatic increases in the use of personal laptop computers. This could also point to differences in public versus academic library, or to the specialized needs of Business Library patrons.

The high use of electronic resources such as computers and laptops also shows a stark contrast to the number of students physically searching for paper resources in the library. Only 0.2% (two individuals in total, the whole semester) were observed physically searching for materials in the stacks or book shelves throughout the observations. This lack of use of the physical collection is surprising given the fact that these resources take up a large amount of space in the Winspear. The reason for this lack of use of the physical collection may be attributed to undergraduate business students' tendency to prefer online and electronic resources (as noted by Lombardo and Miree 2003) over paper resources, as well as the nature of business students to turn to technology to maintain a competitive advantage (as discussed by Atkinson and Figueroa 1997).

In addition to the high computer and laptop use in this library, was the high percentage of library patrons observed to be talking in the Winspear (16.5%). This is a relatively high statistic compared to more traditional quiet activities such as reading and studying, which were 43%. With this number of students partaking in discussion (what some may consider to be 'noise'), it shows how student interests may well be coming into conflict when it comes to quiet and noisy spaces in this library. These findings certainly support the many scholars who have recently recognized the need for academic libraries to provide areas for quiet reading and studying, as well as discussion (Given 2007; Eng and Gardener 2005; Shill and Tonner 2003).

Changes in Patron Activities Throughout the Semester

There were some interesting changes observed in library patron activities when each month was compared over the semester (see Table 4). The most drastic and surprising changes were in the increase of the use of laptops by 18.6% from September to November while reading and writing decreased from September to November by 19.6%. This is a very high percentage of people using laptops, and when compared to the number of spaces in the Winspear that are reserved as a priority for laptop users (i.e., twelve "laptop priority" study carrels versus twenty-five users observed using laptops in the morning of Friday November 24th), the numbers are not found to be in equal proportions; in effect, there are fewer areas set as 'priority' for laptop users than there are actual laptop users in the library. As laptop users seem to be increasing by the day, it seems that the Winspear needs to reconsider the number (e.g., of carrels) and size of areas dedicated for laptop use.

Another interesting finding was that talking increased from the beginning of the semester towards the end by 5.3%, not what one might expect as the semester wore on, as students have an increase in their workload. However, given the literature showing that there is an increase in group work (e.g., Shill and Tonner 2003; Eng and Gardner 2005),

Patron activities observed throughout the semester in percentages

(Total number of people observed= 875)

Activities	*September (259)*	*October (305)*	*November(311)*
Reading/writing (376)	53.7% (139)	43.0% (131)	34.1% (106)
Using library computers (132)	14.7% (38)	16.1% (49)	14.5% (45)
Using other library technology (8)	0.8% (2)	0.3% (1)	1.6 (5)
Using laptops (175)	9.7% (25)	20.3% (62)	28.3% (88)
Eating/drinking (29)	5.0% (13)	2.0% (6)	3.2% (10)
Physically searching (2)	0.4% (1)	0.3% (1)	0.0% (0)
Talking (144)	14.3% (37)	15.7% (48)	19.0% (59)
Using cell phones (13)	1.2% (3)	0.7% (2)	2.6% (8)
Using PDAs (12)	0.8% (2)	1.3% (4)	1.9% (6)
Listening to walkman/I-pod (73)	8.9% (23)	5.6% (17)	10.6% (33)
Sleeping (26)	2.7% (7)	1.6% (5)	4.5% (14)
Sitting/watching (16)	2.3% (6)	3.0% (9)	0.3% (1)
Interacting with staff (5)	0.8% (2)	0.7% (2)	0.3% (1)
Other (2)	0.8% (2)	0.0% (0)	0.0% (0)

Table 4 – Percentages of patron activities by month. Please note that multiple activities (multi-tasking) been added into the totals.

this may be seen as an indication of the type of work that library patrons in this particular library undertake (i.e., Business students).

One interesting change observed between September and November is an almost doubling in the number of people sleeping in the Winspear (from 7 observed in September to 14 observed in November). This might be normal if one considers that as the semester gets more difficult and busy students get more tired and take time in their schedules for naps while they are studying (see Figure 5).

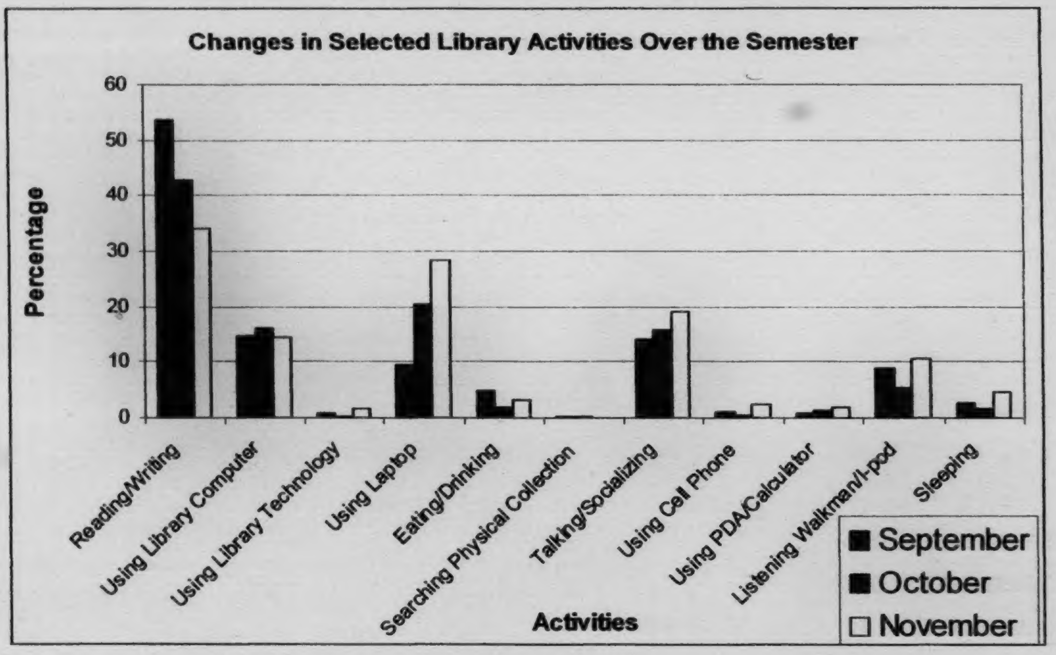


Figure 5– Changes in library activities over the semester by month.

GIS Visualization of Observational Sweeps

Having the statistics related to the observational sweeps is very useful for understanding the general demographics, possessions and activities of patrons in the Winspear Business Library. However, the GIS portion of the analysis of these observations is key to understanding and visualizing where these activities are taking place, and how they might be affecting the library spaces. Through these visualizations, a better understanding of some of the major issues and activities occurring in this library is demonstrated, such as: the uses of quiet versus noisy spaces; places where people are eating and drinking; areas where people are sleeping; and, areas where people are using their laptops. These issues are some of the major problems mentioned by the Winspear staff (and also seen through results of the patron questionnaires, discussed later in this Chapter); they also give insight into the ways that people are using this particular library. It is hoped that the staff at the Winspear Library may use these maps and visualizations to better understand and plan library spaces. However, these findings may also be useful in the context of other small academic libraries to better design efficient and useful areas for patron use.

Visualizing Areas of Use of Library Spaces – Food and Drink, and Sleeping

As mentioned previously, one of the recent changes in this particular academic library was allowing patrons to have food and drink. Traditionally, libraries did not allow eating and drinking in the Winspear due to the possible damage that could occur to physical collections and books (e.g., spilling, insects drawn to crumbs, etc.). In addition to damage to the collections, food has been thought to disturb other patrons due to the noises and smells, as well as the rustling of plastic bags that often accompany patrons' eating and drinking. Today, many libraries allow patrons to bring food and drink into the library, and eating and drinking seem to be commonplace.

In this particular library, patrons were observed with food and drink in almost every seat and area in the library (see Figure 6). There were no spaces in this library where food and drink were not seen; indeed, the Winspear was often used almost as a cafeteria, as students were often observed eating their lunches during the noon hour. In the case of transforming library spaces to suit the needs of patrons, the librarians have had to put out additional garbage cans, so that patrons have a place to put their garbage. In fact, one librarian even commented that the Winspear is actually cleaner now than when food was not allowed in the spaces, as people are actually using the garbage cans, as opposed to trying to hide garbage in the stacks or under desks/carrels (conversations with library staff at staff meeting, February 2007).

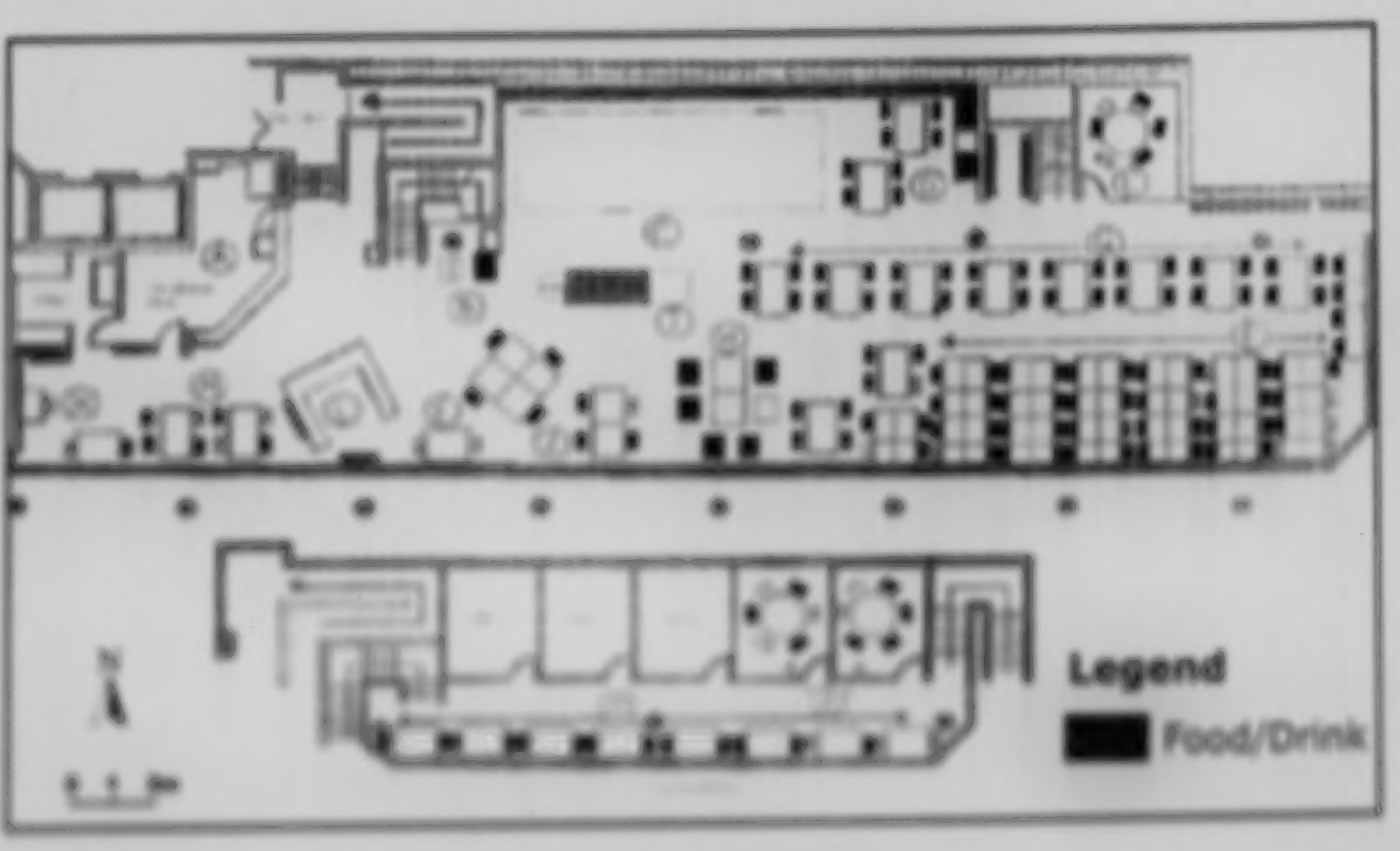


Figure 6: Close up of first floor areas where patrons were observed with food and drink in the [illegible]. Note that in almost every possible area of occupancy in this part of the library patrons were observed with food and drink.

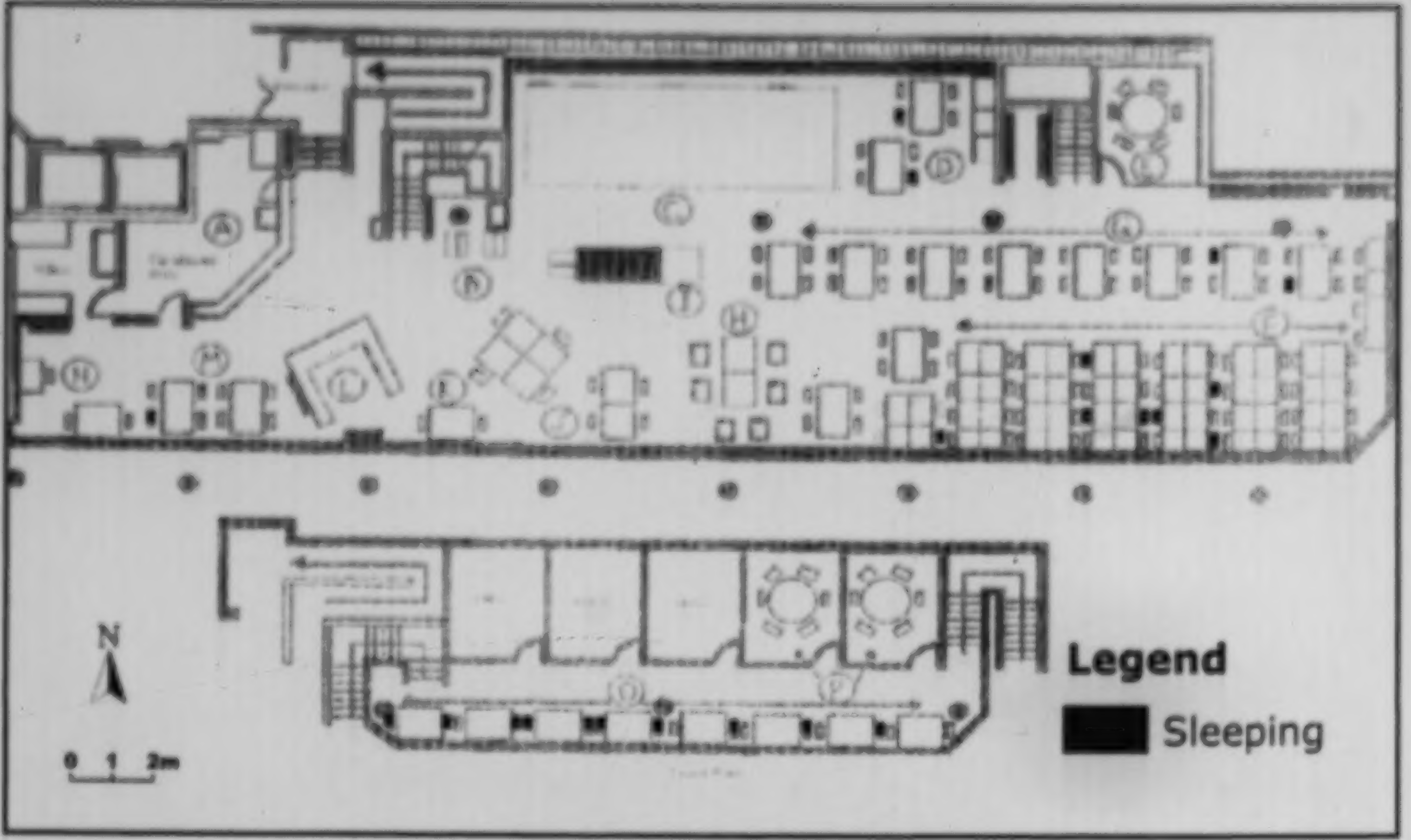

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Figure 7 – Areas in library where patrons were observed sleeping.

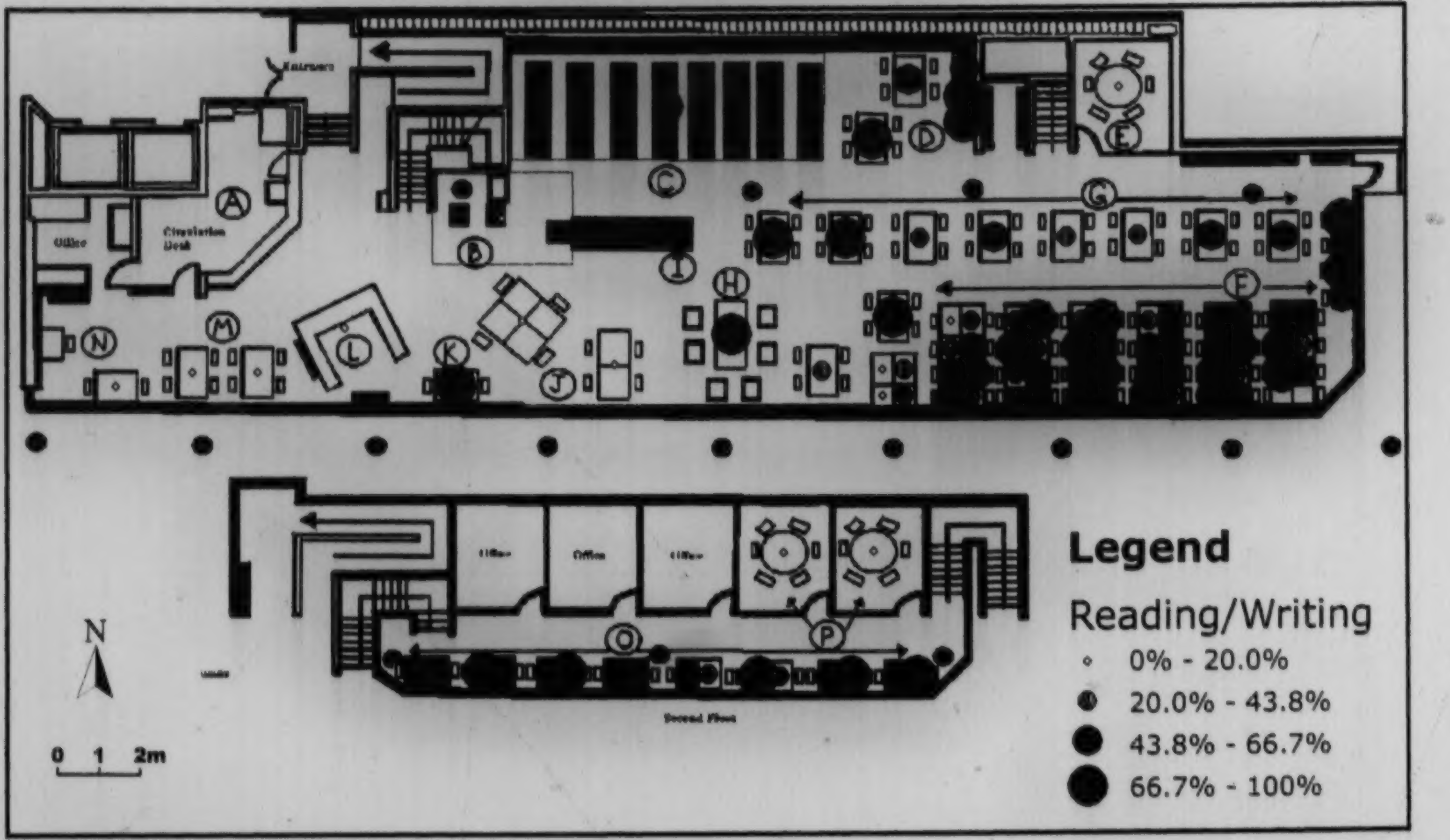
In addition to seeing areas where people were eating and drinking, numerous patrons were also observed sleeping in the Winspear Library (see Figure 7). Favourite areas for patrons to sleep were found both in the study carrels on the first floor and the second floor in the carrels. On the second floor, patrons were observed sleeping in almost every possible seat, and this number also increased as the semester wore on. As the second floor had recently been designated by librarians a total 'silent area' at the time of the observations, this may have contributed to a greater number of patrons seen sleeping in this particular area. It was also noticed that the temperature was also warmer on the second floor, and an area of low traffic (not as many people walking by), possibly making it a very comfortable place for library patrons to have a nap.

Visualizing Areas of Use of Library Spaces – Reading and Writing

There were many areas where many patrons engaged in reading and writing activities in the Winspear (see Figure 8). The areas most heavily used for these activities were the study carrels, as well as in the areas surrounding the work tables on the first floor. The carrels on the second floor were an area of very high reading and writing activity levels, mainly because this area had been recently designated as a total quiet area, where 'no talking' rules were being heavily enforced (especially during October, the mid-term exam period). Areas of the lowest usage were found in the group study rooms, at the computer terminals, by the photocopiers, and in some of the carrels on the first floor, where laptop use is prioritized. There was also a small amount of reading and writing occurring at the work tables on the first floor. This is unexpected, as the whole first floor is intended as a quiet study area, and reading and writing would usually be expected in this area. In addition, there was almost no one reading and writing in the areas with higher traffic, such as the circulation desk and the computers.

Visualizing Areas of Use of Library Spaces – Patrons Talking

Although the spaces on the main floor of this library are intended to be places for quiet study, there was a great deal of talking observed during the observational sweeps. The balance between quiet and noisy areas in library planning has recently been an issue


A
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O
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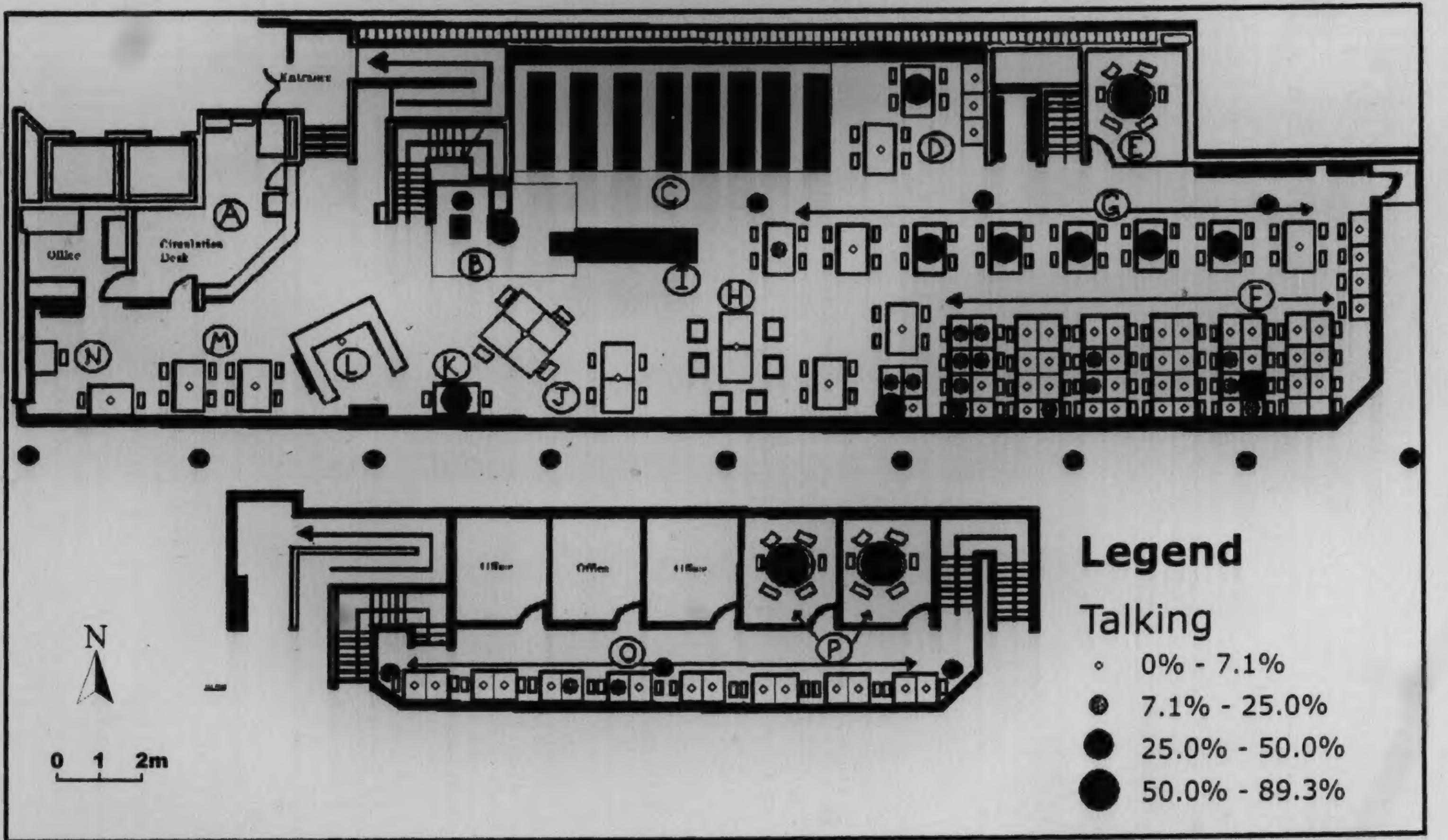
Office
Circulation Desk
Office
Office
Office
Second Floor
N
0 1 2m
Legend
Reading/Writing
0% - 20.0%
20.0% - 43.8%
43.8% - 66.7%
66.7% - 100%

Figure 8 – Map of areas in library where patrons were observed reading and writing. The darker areas with the largest circles are where the heaviest areas of total reading and writing were occurring throughout the semester. The areas are shown in densities (out of the total number of occupants that were in that area).

in the scholarly literature (Given 2007), and this library is no different. In casual conversations with the library staff, as well as through the results of the patron questionnaires (see later in this Chapter), one of the major problems discussed is the lack of places for people to talk and do group work. Library planners often have a difficult time trying to balance loud and quiet areas, and in a small space such as in this library, this has proven to be especially difficult. As can be seen in Figure 9, those who are talking or attempting to do group work can be found in numerous areas throughout this library. However, if compared to Figure 8, we can see that some of the areas where the highest amount of "talking" is taking place are found right next to the areas where people are partaking in quiet study (e.g., Zone 'F', first floor study carrels next to work tables). In fact, areas with a high number of patrons reading and writing are only occurring outside of the areas where talking is occurring, pointing toward the areas where patrons are talking (e.g., work tables) as an area avoided by those wishing to engage in reading and writing.

Areas of Talking/Discussion - Group Study Rooms

Talking is occurring in areas where this activity might be expected, such as the group rooms on the first and second levels of the Winspear. These rooms are equipped with 6-8 chairs, a computer and a white board. They are used mainly for group work and meetings, and are often booked in advance by library patrons. These rooms are completely separated from the rest of the library by soundproofed walls and windows. The three rooms were occupied frequently during the observations, and a large number of questionnaire respondents commented that the group rooms were usually full, or booked to be used, well in advance. With only three rooms, these places have the highest frequency of usage for discussion and talking compared to the other areas of the Winspear.


Entrance
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N
O
P
N
0 1 2m
Legend
Talking
0% - 7.1%
7.1% - 25.0%
25.0% - 50.0%
50.0% - 89.3%

Figure 9 – Map of areas in library where patrons were observed talking. The darker areas are where the heaviest areas of total reading and writing were occurring throughout the semester. The areas are shown in densities (out of the total number of occupants that were in that area).

Areas of Talking/Discussion – Photocopiers, Printers and Microfiche Terminals

The other areas of the Winspear where there was a high amount of talking was around the photocopiers and printers. Library patrons would often engage in discussion around these areas while they were waiting for their documents to finish copying or printing. In addition to discussion, the noise of the photocopiers and printers is loud enough that these areas are purposefully located away from the areas of quiet study, closer to the back of the Winspear (see letter "B" on Figure 9). These areas were heavily used, and seemed to function as a socializing area, as a high amount of joking around and non-academic discussion was noted by the researcher in these areas.

In addition to these areas of talking, the microfiche terminals, which give patrons access to specialized business subject materials, were also observed as areas of heavy discussion. These terminals are located close to the reference desk, due to the somewhat complicated nature of the microfiche and help that is needed in working with these machines. The high level of discussion that occurs in these areas is likely due to patrons needing help from library staff or talking with other individuals who have experience with these machines.

Areas of Talking/Discussion – Work Tables

Librarians and patrons alike noted that one of the major problems in this library is the number of people talking on the first floor, which is meant as a quiet study area. As seen in Figure 9, the highest levels of discussion that are occurring in this area of the Winspear are almost completely at the work tables in the middle of the first floor (see Figure 9, area 'G'). This makes sense, as when people are facing each other, they are much more likely to be tempted to engage in conversation. Unfortunately, the small size of this library means that those who are talking are very close to those who are trying to read or quietly study in the study carrels. The findings from the patron questionnaire showed that many people were greatly disturbed by the amount of talking and noise occurring in this part of the library (see later in Chapter under "Questionnaire" section), and many people have asked that librarians enforce the 'no talking' rule in this area. Librarians have tried to keep this area quiet by creating small signs that sit on the tables (i.e., *This is a quiet study area, please respect other patrons trying to study*), but according to one librarian these signs are often defaced and ruined (conversation with librarians from the Winspear Library at staff meeting, February 2007). The librarians have been trying to find a solution to this problem to enable efficient and useful work areas while also providing a quiet/conversation balance in the spaces to suit all the needs of the patrons of the Winspear. A possible solution for this problem is discussed in Chapter 5.

Visualizing the Areas of Laptop Use

As seen through the observations (20% patrons observed using laptops), as well as through the responses from the patron questionnaires (61.1% of patrons using their laptops on a regular basis – see later in this Chapter), this library has a high percentage of laptop users. Laptop users have special needs such as power outlets, wireless networks, and additional lighting. This library has attempted to satisfy library patron needs by offering wireless access in the entire building, study carrels where laptop users have priority, as well as power outlets and small lights in all of the study carrels.

However, even though these adjustments to library spaces have been made, it seems that laptop users are flocking to particular areas of the library, including areas where these special requirements are not being met. Figure 10 shows a number of areas that have high numbers of laptop users. One of these areas is the group study room (see letter "P" on Figure 10) on the second floor, where it was observed that students would often use their laptops while doing group work. Often, these library patrons would use a laptop even though computers are provided in the study room. This use of a personal laptop instead of the computers provided by the Winspear could be due to patrons using materials easily accessible on their laptops, but more likely it is due to the fact that laptops can be brought onto the group table, and into the circle of group conversation. When doing group work, it is likely that group members prefer to face one another during discussion, as opposed to having one group member facing away using the computer in the corner of the room. Figure 11 shows a typical computer configuration in one of the group study rooms.

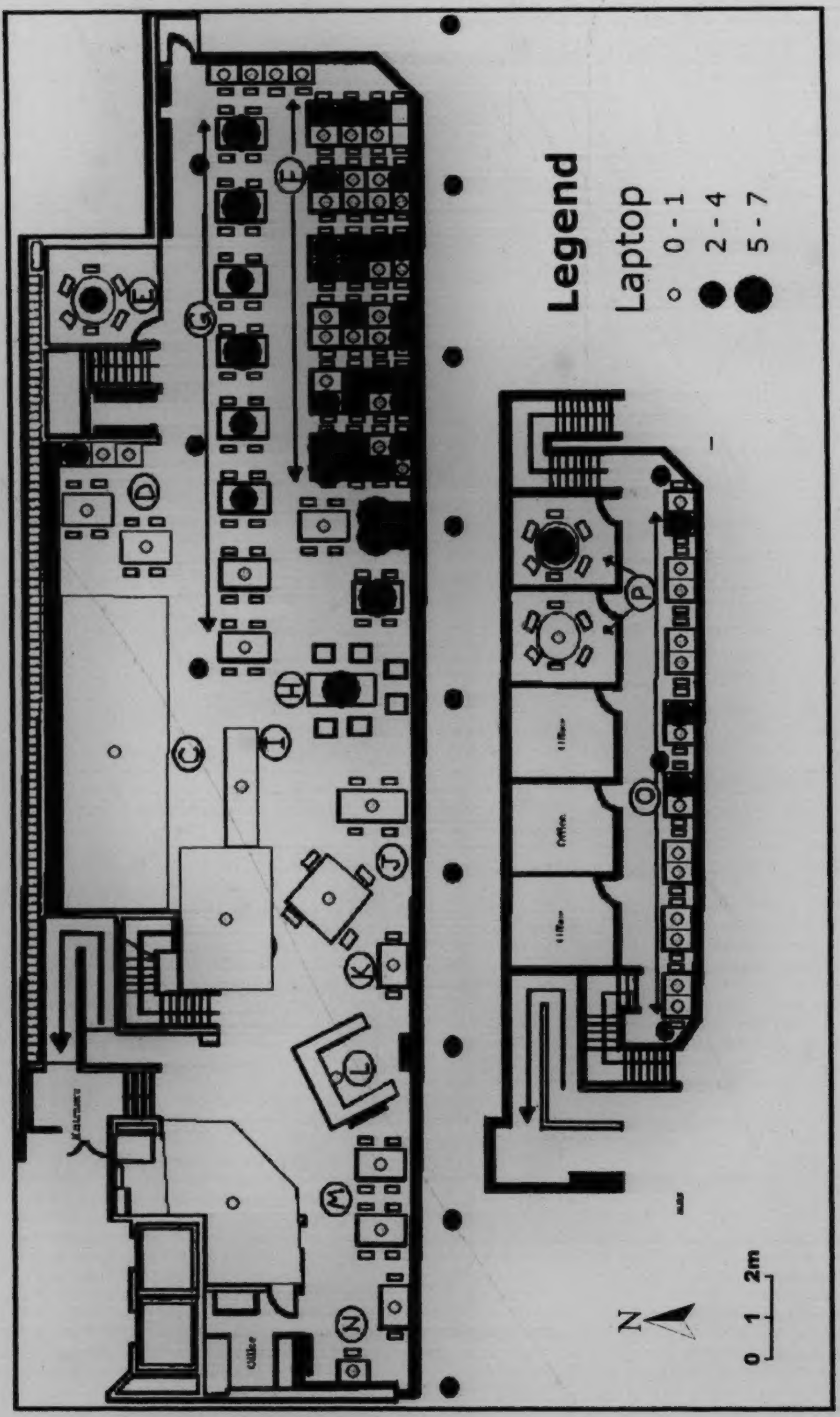
Legend
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Figure 10 – Map of areas of laptop use throughout the semester. Total numbers of patrons using laptops.

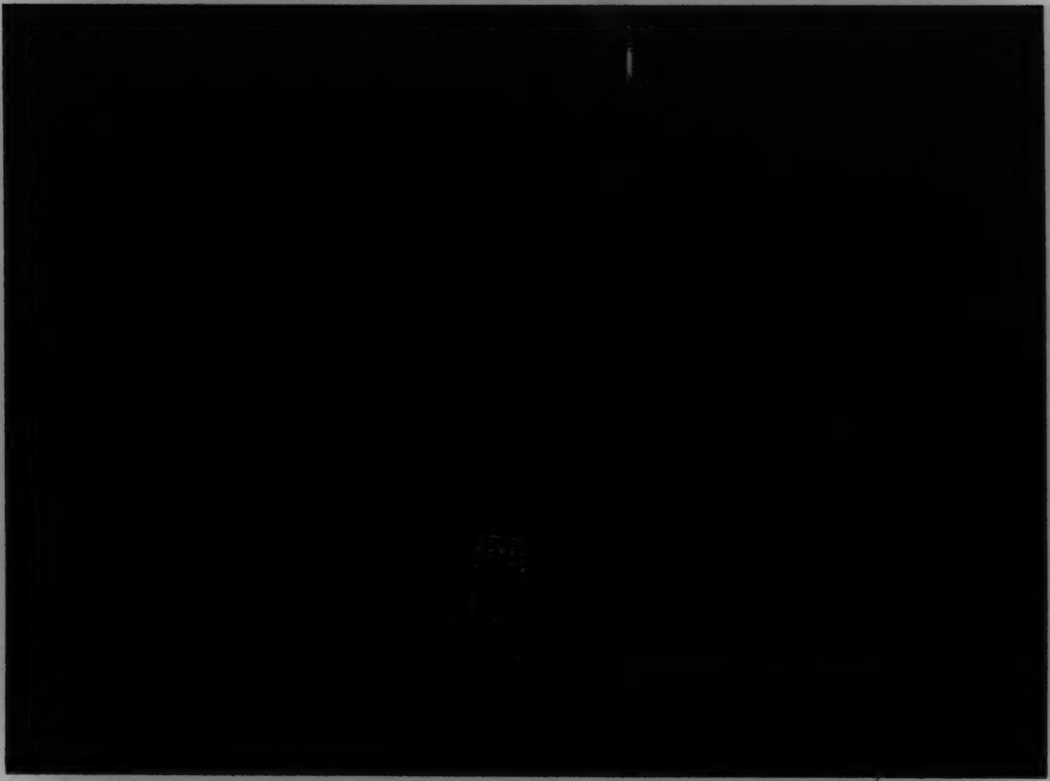


Figure 11 – Image of the computer provided by the Winspear in one of the group study rooms. Note that the computer is in the corner of the room, and does not face the group table in the middle of the room.

In addition to the group rooms, some of the highest numbers of laptop users were found in the areas that are prioritized for laptop users (i.e., the first two rows of study carrels on the first floor, see Figure 10, area 'F'). However, interestingly, these areas were only observed to be highly used on the end of the rows of carrels – meaning that the highest laptop usage in the laptop priority area is only on the ends, and not as much in the other priority carrel seating. This is possibly due to the fact that laptop users feel that they need more room, and perhaps feel more comfortable in the carrels where they are able to freely move and have more room to move, at least on one side of the carrel work space. This finding points toward the need for better design of laptop priority areas, and perhaps larger spaces for laptop users.

Surprisingly, some of the highest areas of laptop usage were not in the priority laptop study carrels, but rather at work tables. Patrons were often observed using their laptops at the work tables, with their books and other technology (i.e., cell phones, calculators, etc.) spread out around them. Even though there are power outlets all through the study carrels on the first floor, patrons often chose to sit at the tables, even if this meant running the power cable across the walkway between the work tables and study carrels on the first floor to plug in their laptop (see Figure 12). It is possible that patrons ran wires to outlets in carrels as they wanted to sit at the work tables to use their laptops, but did not have access to power outlets at the tables. This points to patrons' desire to use their laptops in areas where they are provided with more space than in the carrels. The researcher observed patrons running wires across the walkway on a number of occasions, and even witnessed one individual trip and fall on the wires during one of the observational sessions during a busy noon hour. As this library gets very full, especially during mid-day, this practice of patrons running wires across the walkway could prove to be quite dangerous to other library patrons, and could be considered to be a hazard.

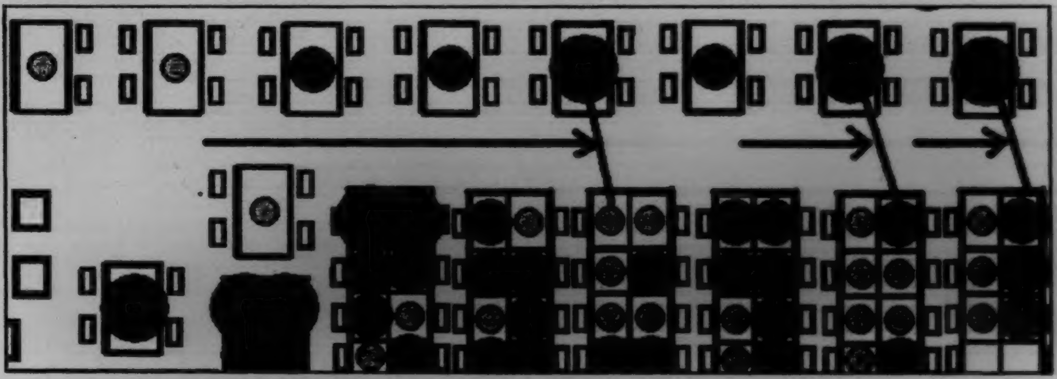


Figure 12 – Map of areas where students were observed running cables across walkway.

The patron use of spaces for eating, sleeping, reading and talking, as well as laptop use in this library are some of the major issues in space planning in this library. As the Winspear gets increasingly busy throughout the semester, these problems seem to increase in severity (e.g., more talking, more laptop users running cables across walkways), which points to the need for increased attention to design and space issues in this library. Through the use of GIS visualization it is possible to better understand the habits of users in this library. These visualizations of library spaces will help library planners to improve upon the spaces provided to patrons, and better understand the problem areas and places of congestion that are occurring in the spaces.

Winspear Library Patron Questionnaire

Although the observational data and GIS analysis provide a good understanding of how the spaces are being used throughout a typical academic semester, these methods do not give any insight into the needs, preferences and opinions of library patrons on space planning issues. While one may guess at what is occurring in certain places, and what library patrons may need regarding spaces (e.g., high use of work tables pointing toward need for more spaces for laptop use), one cannot say for certain that patrons' needs are not being met without asking the patrons themselves.

This portion of the study was designed to help the researcher to better understand the needs of the Winspear patrons and assess their preferences regarding the spaces in the library. A questionnaire was administered that included both open and closed questions to find out what library patrons thought about the spaces, in a way that included allowing them to answer in their own words and express any concerns or ideas that they might have. There was a very high rate of return for these surveys, at a total of 91% (322 questionnaires returned out of 353 distributed). The high rate of return may have been due to the set up of the Winspear (there was only one entry/exit), or just that the students were aware of the study's goals and status of the researcher (a student like themselves), and wished to help out with the study. However, as evidenced by their responses, the high rate of return could also be due to the fact that the Winspear patrons care a great deal about this library and the spaces where they work.

Status and Affiliation of Questionnaire Respondents

As this library is located in the School of Business at the University of Alberta, it is no wonder that the majority (73.4%) of patron respondents were students registered in Business programs (see Table 5). Out of all respondents, 95% (306) were full-time undergraduate students, with only 1.6% (5) being part-time undergraduates, 1.9% (6)

being full-time graduate students, and 0.3% (1) being part-time graduate students. Other status categories of questionnaire respondents included 1.5% (5) being 'other', which included visiting scholars or an undisclosed affiliation. Also, as scholars have observed, many graduate students tend to work from home or in graduate student offices, as opposed to in the library (George et al. 2006). Given the layout of the campus, as well as the location of the Business Library, these findings were not surprising. As mentioned previously, the Winspear is located in the School of Business, making Business users as the most likely patrons at this library at 75.6%. However, there are a number of students from other faculties who appear to be using this library as well. This could be due to the location of the Winspear, which is close to the Arts departments (10.9% of survey respondents named Arts as their home faculty), as well as close to the Science

Unit and affiliations of questionnaire respondents (N=323)		
Affiliation by Faculty/Unit	*Number*	*Percentage*
Business	237	73.4
Arts	35	10.8
Science	25	7.7
Engineering	5	1.6
Agriculture, Forestry and Home Economics	4	1.2
Law	4	1.2
Education	4	1.2
Non-Academic Unit	2	0.6
Medicine and Dentistry	1	0.3
Nursing	1	0.3
Phys Education and Recreation	1	0.3
Undisclosed	4	1.2

Table 5 – Unit and affiliation of questionnaire respondents by faculty/unit. Percentages may not add up to 100% due to rounding.

departments (7.8% of survey respondents named Science as their home faculty). In addition, the collections that are housed in the Winspear are specific to the needs of Business students. However, it is difficult to say exactly why people come to this particular library, as this was not something that was explored in the questionnaires.

General Demographics

As in the observational sweeps, the gender and ages of questionnaire respondents were almost the same, with 51.9% and 48.1% females, and most under the age of thirty at 97.8% (only 2.5% between the ages of 30 and 60, and 0% over 60). Once again, these demographics point toward the fact that this is a library in the Business School facility, mainly used by students. However, there was a slight increase in the number of patrons in the age category of 30 to 60 years old. It is possible that while doing the observational sweeps, patrons over the age of thirty were mistaken for under the age of thirty, as this was only an estimate, and the patrons were not asked their ages in the sweeps. Unfortunately, a finer breakdown of the age groups was not asked in the questionnaire, making it difficult to understand more about the patrons in terms of ages (e.g., are the patrons mostly in their early or late twenties?).

Frequency and Times of Patron Visits to the Winspear

As has been seen by the observational data and GIS visualizations, this is a very heavily used library. However, these observations gave no indication as to how often, or during what time of day, week, and month patrons prefer to come to this library. The following section will describe the results of questions asked regarding the frequency of patron visits to this library.

Not only is this a very popular library on campus, but it is also frequented by many of the same patrons each day (see Table 7). Out of the patrons questioned, 186 (57.8%) users visited the Business Library in person once a day. This percentage seems to be very high, and shows that the patrons in this library are many of the same typical

Frequency of Patron Visits to the Winspear in Person (N=322)		
	Percentage	Number
Once a day	57.8	186
Once a week	23.9	77
Once a month	8.7	28
Once a term	3.7	12
Once during the academic year	1.9	6
Less than once a year	1.2	[illegible]
Undisclosed	2.5	8

Table 6 - Frequency of patron visits to the Winspear in person by times of day/week/month/term/year

users, who come to the Winspear as part of their everyday routines. To enhance this idea is the fact that many of the patrons also come to the Winspear during the day, and not nearly as much in the evenings or during weekends.

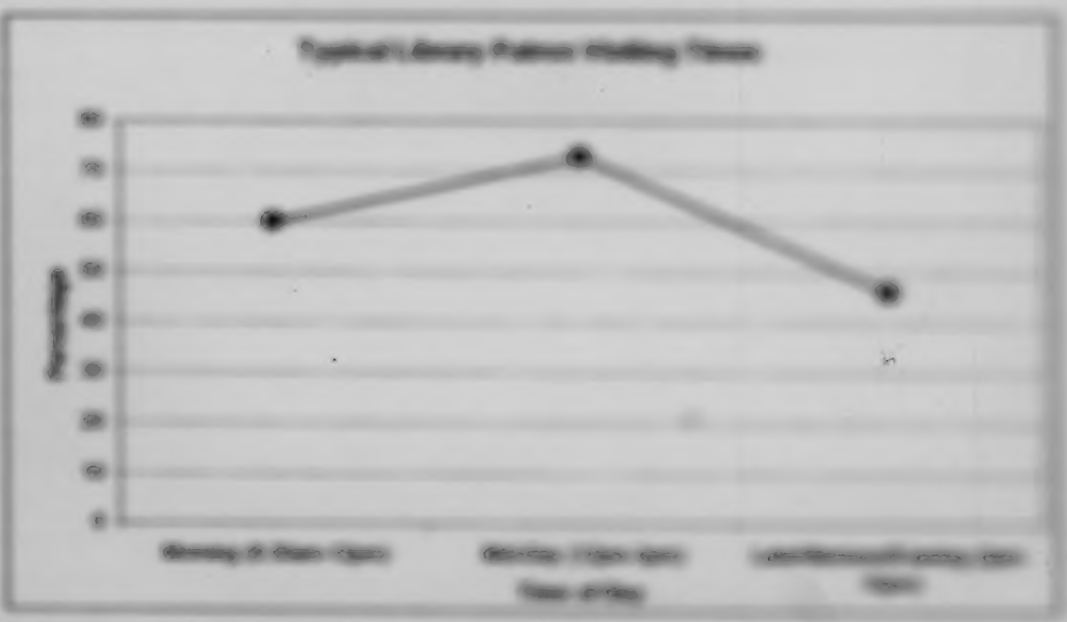


Figure 13 - Patron visiting times during a typical day

As was expected given the observations made in the sweeps, most library patrons come to the Winspear during the mid-day and early afternoon (see Figure 13). It seems that many of the Winspear patrons tend to use the library as a part of their everyday habits, which may include frequenting the Winspear around the middle of the day, possibly to eat lunch, study and socialize. In addition, patrons reported using the Winspear during the beginning of the week (Monday and Tuesday) at a rate of 87.3%, during the mid to late week (Wednesday, Thursday and Friday) at a rate of 91.9%, and much less during the weekend (at 56.5%) when classes are not in session. This may have implications for library staffing, as a higher number of employees would be needed in the day than in the evenings or weekends.

Patron Activities in the Winspear

This library is a hub of academic and social activity. Patrons are engaged in a number of things at any given time of day, including reading and writing, talking and discussion, eating, and the use of various technologies. The responses of library patrons to what type of activities they typically engage in the business library returned a glimpse of the very different, and often multiple ways that this particular library is being used. A better understanding of what patrons claim to be doing in this library compliments the findings from the observational sweeps, and will be useful for library planners in helping design spaces that suit what the users need.

Patron responses from the questionnaire show them to be engaged in a number of activities, as outlined in Table 8. From those results, we can see that there is a great deal going on in this library. First of all, although there was a decrease in reading and writing observed in the sweeps throughout the semester, patrons were still mostly using library spaces to read, write and study (84.2%). It is encouraging to note that although spaces are being used in so many ways (such as eating and sleeping), that the Winspear is still used mostly for academic pursuits. This also shows that the large area and spaces that have been set out by librarians for studying and reading are serving their main purpose and patron needs.

That being said, almost fifty percent of patrons also report using this library for group work and discussion. In comparing the number of people talking (48.8% for working with a group, and 16.5% for socializing with peers) with those results from the observational sweeps (16.5% of patrons observed talking), we can see that there is even more talking and discussion going on in this library that was observed in the 'seating sweeps'. This points toward a much different use of library spaces than just reading and writing, and also raises the question of whether there are enough spaces that are suitable for this type of activity. In the Winspear library, there are only three group study rooms, all of which are booked solidly throughout the semester. With almost half of the Winspear patrons surveyed using the library for group work, it would seem that only three rooms may not serve the needs of the many patrons that frequent this library.

The high percentage of many of the other activities that are taking place in this library point toward the various ways that patrons are using library spaces. With 33% of patrons using the Winspear as a place for eating, 23% using the Winspear for sleeping, and almost 17% using the spaces for socializing, activities that were once hidden (such as eating) are taking place out in the open, and are becoming commonplace. Due to these changes, design and space issues have also had to be dealt with, and problems have arisen in trying to accommodate areas for all users. One example of changes to suit the needs of patrons are the increased number of garbage cans in the Winspear. In addition to this, librarians have had to be more vigilant and careful when closing the library, as attention must be given to whether students may be sleeping in the study carrels (Noted by a librarian at a February 2007 Winspear Library staff meeting).

In addition, these results show a decrease in traditional library uses such as searching for print materials. In this library, the stacks of materials take up a great deal of the space (see Figure 2, Chapter 1), and from the results of the observational sweeps and questionnaire, these large areas seem to be getting very little use (5.3% of people use the Winspear to search for physical materials). An understanding of the under-use of these areas could be useful for library planning in the future, as the Winspear is already going under a "systematic downsizing of its physical collection" (quoted by a library administrator at the Winspear), and may need to continue to do so to meet the space needs of the library patrons.

Patron Activities in the Winspear (N=322)	
Activity	*Percentage (Number)*
Reading/writing/studying	84.2% (271)
Working with a group	48.8% (157)
Eating/drinking	32.9% (106)
Sleeping	23.3% (75)
Using other personal technology (e.g., PDA, calculator)	19.9% (64)
Asking the librarian a question	18.6% (60)
Reading newspapers	18% (58)
Socializing with peers	16.5% (53)
Just watching/sitting	10.2% (33)
Using other library technology	5.6% (18)
Physically searching for print materials	5.3% (17)
Other – including photocopying and printing	2.8% (9)

Table 8 – Library patron activities. Note that patrons had the option of choosing more than one category.

Patron Computer Usage

As discussed previously, the patrons in this library are heavy users of various technologies. Patrons reported a 71.1% usage rate for computers in the Business Library; of the 28.9% who did not use the Winspear computers, many were patrons with laptops. With regard to computer usage, questionnaire respondents reported various activities, as outlined in Table 9. Patrons are using the Winspear computers for many activities, but especially for checking their e-mail. As this can be a relatively "fast" type of activity (as compared to working on a paper or searching for materials), it is likely that patrons may use computers in the computer labs on campus for longer-term activities. However, library patrons also have the option of using the Winspear's "productivity stations" for longer term activities (e.g., writing papers), as needed. In this particular building, there are two large computer labs directly underneath the library, which may provide additional computer access for library patrons.

Library patron computer usage activities (N=229)	
Activity	*Percentage*
Checking E-mail	89.1 (204)
Working on papers/projects/presentations etc.	40.2 (92)
Searching for electronic resources/materials	38.4 (88)
Playing games	2.2 (5)
Other (e.g., printing coursework, using Blackboard)	17.9 (41)

Table 9 – Library patron computer usage activities. Percentages do not add up to 100, as patrons had the option of choosing more than one.

The patrons' 'Other' computer uses included a large number of people printing coursework and other materials, using "Blackboard" (an e-learning tool used in business courses), and personal uses such as "checking hockey scores", "daily gossip", "checking the stock market" and "checking grades".

Patron Laptop Usage

Although fairly high, at 71.1%, use of the Winspear computers is not as high as one might expect, due to the large number of patrons who own laptop computers. In fact, 67.4% (217 out of 322) of patrons surveyed own a laptop computer, and many of those use their laptops in the Business Library. Of the people who own laptops, 38.1% (83) use these "frequently" in the Winspear and 23% (50) use their laptops occasionally. Therefore, with over 60% of laptop owners using their laptops in the Winspear on an occasional or frequent basis, these users may not have as much need for the library computers as those patrons who do not own laptops, or who choose to use library or school computers.

Unfortunately, laptop users do not have all of the same options as computer users in the Winspear. Besides the lack of power outlets and weak wireless signals (to be discussed further later in the Chapter), one of the main concerns of laptop users was the inability to print materials from laptop computers. This will be an adjustment that the Winspear will need to make as laptop use and demand for laptop-friendly services increases. In addition there is a specialized Datastream computer and a number of databases available in CD format only from a Winspear computer station. As the number of laptop users continues to increase in this library, the Winspear may need to consider making these resources available to laptop users as well as to library patrons working from the library computers.

Spaces in the Winspear

One of the goals of this study was to better understand library patron opinions and preferences regarding the spaces in the Winspear. This is a small library, which makes space planning more difficult, but also more important because librarians must take more care in considering the spaces, and ensuring that they suit the needs of patrons. When searching out places to work, some students may have preferences about where they work. These preferences can be dependent on multiple factors such as the availability of seating, proximity to other patrons or services and amenities, the amount of noise, lighting, and temperature among many other factors. However, whether or not students are able to find places that suit their needs is one of the top concerns of library planners.

Space Preferences of Library Patrons

When questioned on the subject of preferred seating, 60.1% (193) of patrons said that they did have a preferred place to sit in the Winspear. Of these spaces, there were a number of places that patrons preferred to sit, depending on their particular needs and activities (see Figure 14). From these results, we can see that the study carrels on the first floor were the preferred place for patrons to sit. This is in contrast to Xia's (2005) findings that patrons preferred work tables, and also shows the benefit of doing both GIS observational analysis as well as a patron questionnaire. Although work tables were also a popular place to sit, they were not found to be as preferable as the study carrels according to the observational data, as well. It would seem that the first floor carrels suit a number of purposes, as they are not only a place for quiet study, but most also have electrical outlets for laptops. It is no surprise then, that with the high number of laptop users in this library, the first floor carrels are a preferred place for occupants to sit. In addition, this is a library where a great deal of socializing takes place, and the first floor carrels could be seen as a place where patrons may study, but also an area where students can keep an eye on what is going on in the Winspear, and take time out to socialize with peers.

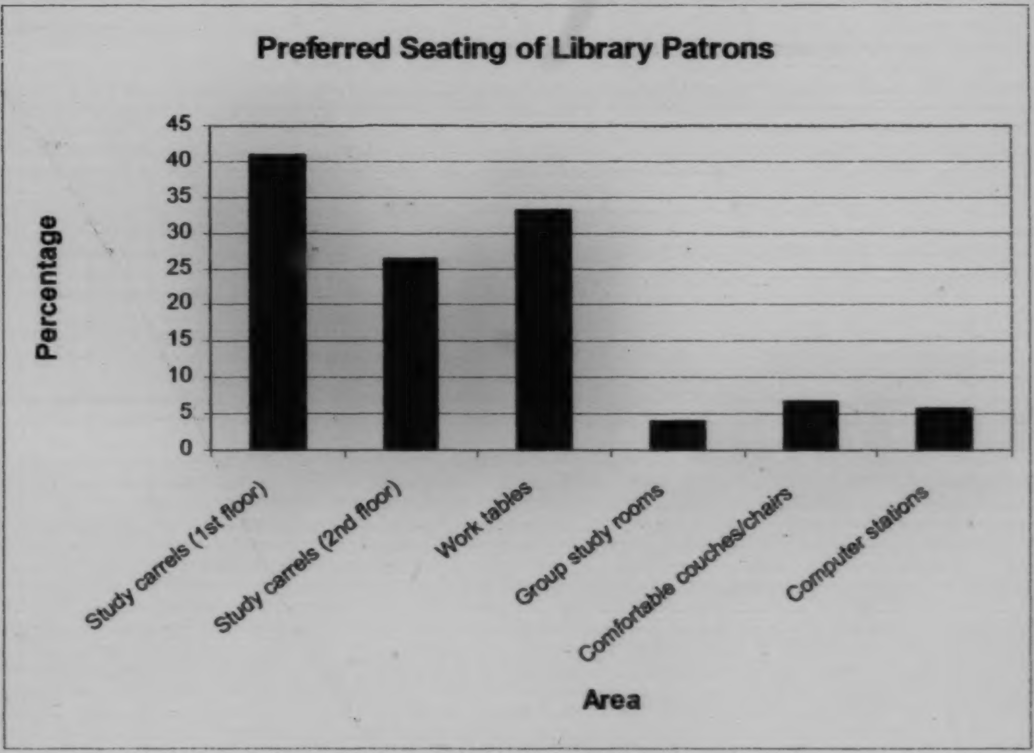


Figure 14 - Patron seating/area preferences.

Patron Opinions and Comments About Places to do 'Individual' Work in the Winspear

Library patrons generally seem to feel very strongly about the spaces in this library. The fact that the rate of return of the questionnaires (91%) was very high shows that patrons really seem to care about the library and the services and spaces that it provides. When asked about their opinions and comments regarding spaces to do individual work in the Winspear, patrons were very responsive and willing to include their ideas and comments about individual spaces.

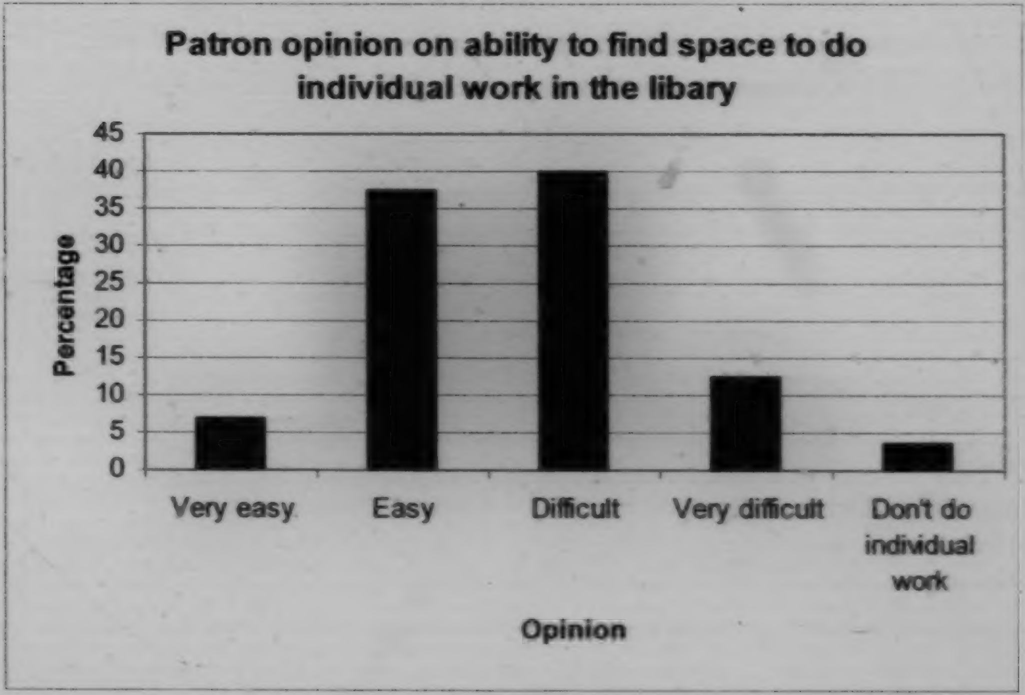


Figure 15 – Patron responses regarding availability of places to do individual work in the Winspear.

As this is a very popular library, it is little wonder that 52.5% (167) students find it difficult or very difficult to find places to do individual work (see Figure 15). On the one hand, due to the small size of this library, there is not a lot that even library space planners can do about this issue. However, many other students seemed to have no problems finding places to do their work. Being able to find a place to do individual work likely depends on time of day, as well as the level of comfort that patrons feel about proximity to other patrons, or levels of noise, etc. As discussed by Aiello (1987), patrons likely have preferences surrounding a certain level of personal boundaries depending on the individual. Some of the patron comments gathered here help to better understand the issues and needs of patrons with finding places to do individual work; and 72.4% (233) of individuals questioned also added a comment or opinion on the topic of individual work spaces in the Winspear.

Patrons Find Individual Study Spaces Comfortable and Pleasant

Many patrons found that they were able to find a place to sit, and that available seating to do individual work was very good. Patrons often had positive things to say about the library spaces. As one student said, "The students here are very serious and quiet. I think this library is suitably confined, easy on the eye and quite clean". Many library patrons seem to feel at home in this library, and find it a very pleasant place to work. A number of patrons commented on enjoying the natural light and large windows in the Winspear, which are in line with Given's (2007) findings, who found that students need spaces which are welcoming, comfortable and filled with "bright, natural light" (180). As was seen from the percentage (81.7%) of students that come to the Winspear at least once a week, it seems that people feel very at ease in this space, even though it is small. As another person noted, "Small space. Limited seats. It's a warm and cozy library and often quiet. I think that's why many people use the Business Library". Although library patrons realize that the spaces are limited in this library, for many it remains a very comfortable, welcoming and great place to work.

Patrons Find Individual Study Spaces Busy and Cramped

Patrons find this to be a very busy library. The majority of comments regarding individual spaces were about the lack of space for study in the Winspear. Most of the comments stated that it is difficult to find a seat, that the Winspear is overcrowded and too busy, or that there is not enough space in general. A number of more specific comments mentioned that there are not enough carrels in the Winspear, and that it can get very cramped. As one person said, "Always very busy, especially how they set up the study carrels, I have to climb over people's chairs to get to my study carrel". Many library patrons described how it is difficult to find space, especially during particular times of the day or the semester – such as during the lunch hour, or during mid-term exams. Some students described it as being the busiest when they needed it most and when the need for individual study spaces is high. As one student noted, "Most of the time it is really busy (especially during midterm week or something). It is hard to find a spot unless you come early and reserve yourself a table (by leaving a book or something)".

In fact, this library is so busy that many students seem to feel the need to "reserve" a place early in the day, to ensure that they would have a place to sit later in the day. This was common practice, but it also was very annoying for those patrons who could not find a place to sit. As one patron noted, "Often the carrels are taken by people who leave their belongings and go away for awhile and there are just not enough carrels to get adequate studying done". This was a problem, as library patrons may be away for hours at a time, while only their belongings "reserve" their place to sit in the busy library. On the other hand, patrons who liked to leave their belongings out to "reserve" a place, wished that there was a way to better lock up laptops or other belongings, so that they would not be taken or disturbed. Having an area where things could be locked up and secured was a comment made by a number of patrons.

Some patrons were able to identify patterns of library occupancy. For example, they would only search out a place to sit at a time right before classes would end, when many students would stream out of the Winspear and seats would be left vacant, but before an influx of students coming in. "It's too busy – unless you're here right when class ends, good luck finding a carrel/table". A few of the Winspear patrons would search out places to sit at times when many students would be going to class, and others would have not finished classes yet. For some patrons when the Winspear is less occupied (even for a few minutes) it is the perfect moment to grab a seat.

Patrons Find Individual Study Spaces Noisy and Distracting

In addition to lack of space, the other most common comment was about the amount of noise in quiet study spaces, and in the Winspear in general. Many patrons complained that there were not enough quiet places to work, and that the amount of talking was very distracting for people trying to study quietly. One individual noted, "There is not enough room and space, most people are talking and it is distractive, library is closed quarters and sound carries far, usually packed with people from 10 am to 3 pm, and I often have to leave because it is noisy and there is no more room or space". The idea that the Winspear is too noisy was mentioned by a number of patrons. As one patron said, one of the sources of the noise seems to come from people who are socializing in the Winspear, "Some people use the library as the socializing hub of the Business building – we have a lounge on the second floor for a reason". Although there are a number of places in the near vicinity to the Winspear that might be appropriate areas to talk or socialize without distracting others (such as this student lounge on the second floor of the building, or the large atrium where many students meet between classes or during the lunch hour), many patrons continue to use the Winspear for this social purpose. For many people, even sitting in a study carrel does not limit the noise coming from other patrons, "… even when you are at a table, someone will sit there and they will to talk to a passer-by or friend. Even if you sit in a study carrel, it can still be loud". It seems that patrons generally feel that there is an excess amount of noise in the Winspear, and few places where they can study in quiet.

Library patrons used various strategies to help with noise in the Winspear, including the use of ear plugs or headphones with music playing. Throughout the observational sweeps, 73 patrons (8.3%) were observed listening to music or using headphones in the library, and this may have been to block out any other noises that the patrons found distracting. However, for some patrons, the sound of other peoples' music (i.e., the sound from their headphones) was also seen as a distraction, and for those patrons who need total quiet when they work, library spaces were seen as highly inadequate.

Patron Use and Opinions on Group Work Spaces

In academic libraries, there has been an increase in the need for places where library patrons can engage in group work and conversation (MacWhinnie 2003; Shill and Tonner 2003). This is especially true in academic libraries at the University of Alberta

(University of Alberta Libraries 2006), where many of the patrons are students working on various projects or assignments that require discussion. This library is one of the hubs for library patrons to come to do work, and group study rooms have been provided to patrons as a place to be able to engage in discussion without bothering other library patrons.

Patron Frequency of Group Room Usage

Although 63% of patrons had a lot to say regarding the group rooms through the comments section of the questionnaire, a large number of patrons rarely use the group study rooms (see Figure 16). In the Winspear 24.5% (79) patrons reported that they used the group study rooms around once a month, and there was also reported to be a high amount of usage both once a week (15% - 48 patrons) and once during the academic year (8.4% - 27 patrons). However, there is also a population of 33% who rarely use the group

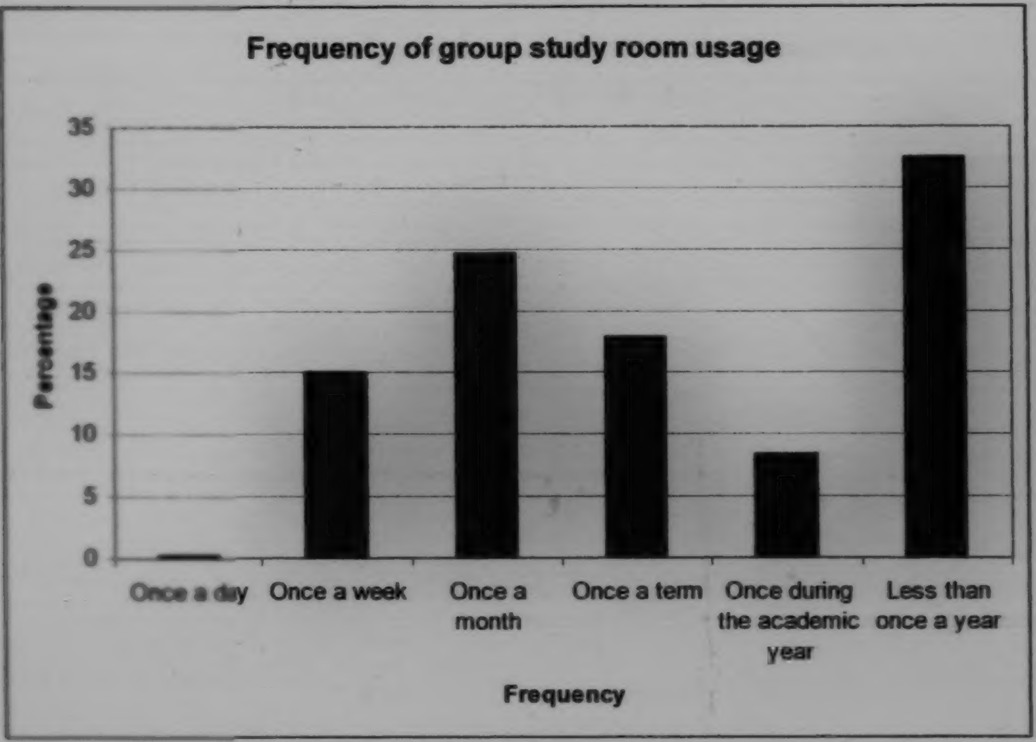


Figure 16 – Frequency of patron group study room usage.

study rooms. This could explain why some of the survey respondents felt that spaces to do group work were sufficient, while others (who may need group spaces more frequently), felt they were inadequate.

Patron Opinions and Comments About Places to do 'Group' Work in the Winspear

As has been seen in the scholarly literature, students are now requiring more areas for group work and discussion in library spaces (Given 2007; MacWhinnie 2003; Shill and Tonner 2003). This library is no different. Questionnaire respondents felt that the spaces to do group work in this library were mostly difficult (28.4% - 91 patrons) or very difficult (23.1% - 74 patrons) to locate (see Figure 17). As the Winspear is mostly populated by students, especially from the Business School, this lack of group study space is seen as a major problem by many of the Winspear patrons. There are only three group study rooms in this library (seating a maximum of ~20 people), all of which require patrons to book ahead in order to reserve the room for a particular time or day.

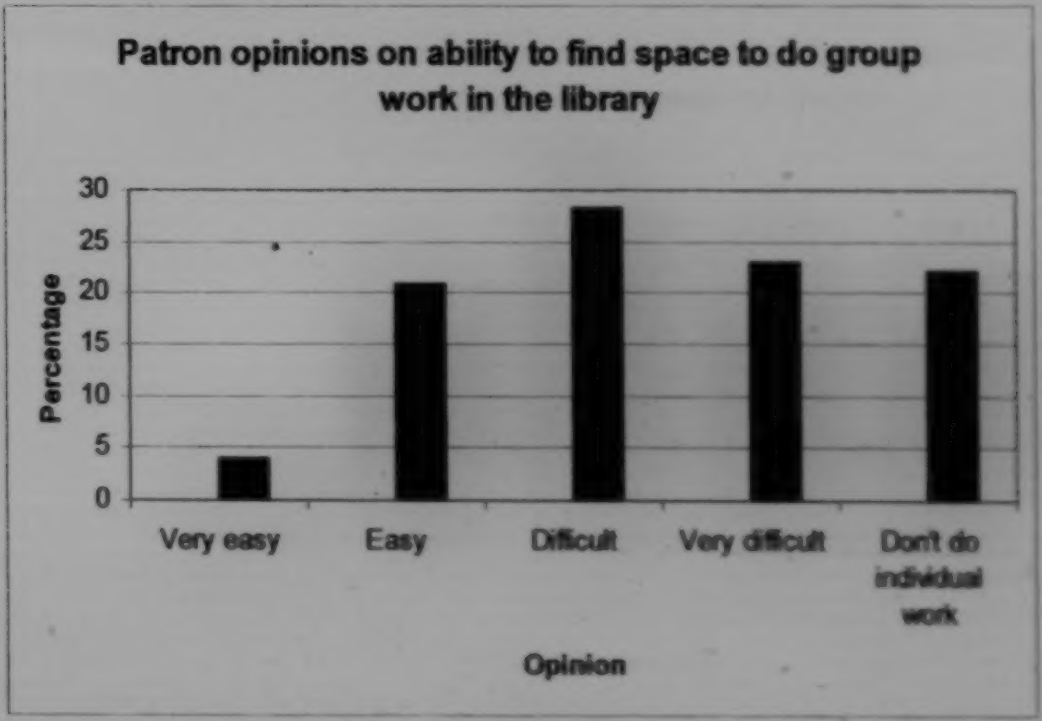


Figure 17 – Patron responses regarding availability of places to do group work in the Winspear.

There were multiple factors that affected the opinions of library patrons regarding group rooms. These were highlighted through the comments that were returned on the topic of the availability of group rooms (i.e., 63% of patrons commented on this topic).

Patrons Find Group Study Spaces Full and Rooms Usually Booked

Generally, patrons found the group study rooms to be booked or filled with other patrons doing group work. Indeed, lack of enough group study rooms was the major complaint of library patrons regarding spaces to do group work in the Winspear. There are a limited number of rooms and patrons reported a desire for more of these. They commented that with the high number of students using the group rooms, and with classes having similar deadlines, that rooms were often booked. As one person noted, "There are only a few group rooms and 2000 business students. Usually the rooms are booked weeks in advance. More meeting rooms would be an asset". This overbooking and lack of room is the source of frustration for many library patrons, and for many, by the time group work is assigned, most of the rooms have already been booked.

However, those patrons who are able to book ahead were satisfied with this process. Many of the patrons commented that as long as they booked rooms far enough in advance, that they were often able to get a room when they needed it.

Patrons Use Work Tables in Quiet Areas to do Group Study

As the group study rooms are often booked, many students have begun to use the work tables on the first floor as a place for discussion and group work. As one patron noted, "you can easily do group work at the discussion tables on the 1st floor". However, although this area is seen by some as a place for discussion and group work, in fact this area is meant to be a place for quiet study. The fact that this area is so close to the study carrels and other areas where patrons are trying to quietly study makes the use of work tables for group work an area of contention in this library. As one individual noted, "The group rooms are small, and there are too few of them. I've tried working with a group at the table on the main floor, but we got asked to leave (since we needed to talk)". Another stated the following point: "People should not do group work in here [on the first floor]. It is too small, and gets too loud. People are looking for a quiet place to study".

Once again we see the conflicting nature of this space for library patrons. There are not enough group study spaces in the Wingspan, so patrons turn to the study tables to do group work, which in turn distracts other patrons. As one questionnaire respondent put it, "There are only three group study rooms for group work, making it very difficult to try to respect the quiet study areas – as basically everywhere becomes noisy". For librarians and library space designers, it is difficult to balance noisy and quiet spaces in this library. As this library is used for a number of different purposes, including both quiet study and group work, some patrons who answered the questionnaire felt that the group study spaces are not meeting their needs. This is an issue that the Wingspan will likely continue to have to deal with as the population of the University (and likely the number of students using the Wingspan) continues to increase. Library designers may have to find another way to design the spaces as to accommodate the needs of patrons needing places for group discussion and study.

Patron Opinions and Comments About Laptop Spaces in the Wingspan

As was seen in the question regarding laptop usage in the Wingspan, [illegible] of laptop owners use their laptops in the library on a regular basis. Laptop users have special needs for work spaces, such as additional lighting and power outlets. In this library, there are two rows of carrels which are used as laptop priority spaces. When questioned on whether or not patrons believed laptop spaces in the Wingspan to be adequate, [illegible] of patrons said "no", and [illegible] said "yes" (with the rest undisclosed or "don't know"). This shows that a large percentage of the patrons using their laptops in the Wingspan are not satisfied with the spaces provided by the library for laptop use. In this questionnaire, library patrons were also asked to comment (and [illegible] did so) on the topic of laptop spaces in the Wingspan; the comments that were returned gave interesting insight into which of the special needs of laptop users are not being met in the spaces.

Patrons Need More Outlets in the Wingspan

One of the most frequent comments by laptop owners was that the Wingspan is lacking in room for laptop users; although many patrons felt that there are enough outlets, they noted that these outlet enabled spaces are often used by other patrons who do not have laptops. As one patron said, "I think that there are enough outlets/spaces, but the rule that laptop users have priority at certain carrels is never enforced. So it's adequate, but sometimes extra space would be nice". Many patrons felt that spaces for laptop users were physically too small (i.e., carrels), and that they wished that the study carrels were big enough to allow for enough space for laptops as well as books and other belongings. For many of the patrons, using the work tables was a way to get more room for their belongings.

However, although many of the patrons use the work tables to complete work with laptops, there are no power outlets close to the work tables. As one person noted: "I don't like to be forced to use the closed desks for laptops, I wanna sit on open tables with my laptop but there are NOT enough electrical plugs". The work tables were mentioned as a favourite space by a number of laptop users, but the fact that there are no outlets close to the tables was a very common complaint. This is interesting, as there were many patrons using the end laptop priority carrels, although this may not be by choice, but perhaps because of no other place to sit. As mentioned before, many patrons would run wires from the carrels with outlets to the tables, causing a hazard for people walking by. As one patron commented: "Only space for outlets in the cubicles. I would like to see some by the tables so I don't have to step over wires (people plug in computers at cubicles from tables)". Numerous laptop users mentioned that they wished to have more outlets by the tables, and better access to power everywhere in the Winspear. Also, it was not only access to power, but also better access to the wireless network (i.e., a stronger signal in the library), and the option for wireless printing, that patrons need in these library spaces.

Many laptop users who responded to the questionnaire felt that the study carrels were too cramped, and also did not fill other needs such as proper lighting and maintenance. These complaints correspond with scholars' discussion of how library patrons require proper lighting in work spaces (Bazillion and Braun 1999; Malman 2005). Unfortunately, in the literature, there is little regarding the needs of laptop users in terms of lighting. According to the patrons in this library, many of the lights needed to do work in the study carrels were burnt out, and some of the outlets were not functioning. In addition to these needs, numerous library patrons commented that the carrel's top shelf got in the way of them opening their laptops all the way. On the other hand, some patrons mentioned that the shelf in the carrels is what enables them to have enough space to do their work. "Without the shelf the answer would be "no" [to the question if spaces for laptop use is adequate]. Carrels are small, but are adequate. Upstairs carrels are better than the main floor. Seem larger and shelf does not get in the way in carrels on second floor. Need working light in all carrels". Therefore, it is not only the spaces in the study carrels that concern laptop users, but also the need for extra lighting, and a shelf with enough room for a laptop to go underneath. In addition to this is also patrons' desire to have a place to lock up their laptops during the day, enabling them to leave the space for awhile without bringing it with them. "The carrels should be bigger, have more light, they should all have some place to lock up laptop". A desire to see areas where individuals can lock up laptops was mentioned by a number of patrons. These concerns show how the rise of this technology is increasing patrons' special needs for particular types of work spaces.

Patrons' Desired Changes for the Physical Library Spaces

Patrons described their desires for a number of changes in the physical design of library spaces (see Table 10). This library is small, but gets used for many different purposes, many of which were reflected in the responses to the questions regarding particular types of areas and spaces in the Winspear. The responses show a number of desired adjustments to the spaces available in this library.

Patrons Desire "More" of Various Kinds of Library Spaces

These results give interesting insight into the needs and desires of library patrons in regards to spaces. It is especially interesting that the two highest areas where patrons desire "more" are the spaces for individual studying (69.5%), and the spaces for group studying (69.2%). This is interesting, as there are many students who do not engage in group work in the Winspear; however, if spaces for group work increased, more patrons might engage in these activities in the library. However, almost equally as high are the numbers surrounding the need for "more" of other types of spaces, namely "sit down" computer terminals (62.9%), work tables (66.1%), and "quick access" computer

Patrons' desired changes for library spaces			
Area/space	*"More"*	*"Less"*	*"Fine as is"*
Space for Individual Studying (n=311)	69.5% (216)	1.6% (5)	28.9% (90)
Comfortable reading spaces (n=301)	45.5% (137)	5.0% (15)	49.5% (149)
Space for the circulation/reference desk (n=294)	6.8% (20)	7.8% (23)	85.4% (251)
Work tables (n=307)	66.1% (203)	5.9% (18)	28.0% (86)
Spaces for group studying (n=305)	69.2% (211)	3.6% (11)	27.2% (83)
"Sit down" computer terminals (n=302)	62.9% (190)	3.7% (11)	33.4% (101)
"Quick access" computer terminals (n=298)	52.7% (157)	3.7% (11)	43.6% (130)
Spaces for laptops (i.e., with plug-ins) (n=297)	42.4% (126)	1.4% (4)	56.2% (167)
Space for the print collections/book (n=291)	17.5% (51)	8.6% (25)	73.9% (215)
Clocks (n=303)	44.5% (135)	1.7% (5)	53.8% (163)
Natural light or other lighting (n=291)	35.4% (103)	0.3% (1)	64.3% (187)

Table 10 – Patrons' desired changes for library spaces. Totals may not add up to 100% due to rounding.

terminals (52.9%). This shows that patrons want to see more of almost all areas, where they may do individual work, group work, and have access to computers. In addition to these spaces, wanting "more" spaces for laptops is also high if you consider that 60% of the patrons use laptops in the Winspear. Other categories (e.g., natural lighting) were generally thought to be "fine as is". It would seem that the areas where library patrons would like to see changes are in more spaces and areas to sit and work, in areas that suit their various needs.

However, patrons made comments about various "other" things that they would like to change. These comments included such things as more plants, more personal spaces for librarians, and more artwork. However, it was not only physical aspects of the spaces that patrons desire "more" of, but also intangible things such as better ventilation and more window blinds that open. In addition to these aspects of the spaces, a number of patrons also commented that they wanted to see more divisions between quiet and noisy space and more done to enforce these divisions, such as additional signs telling people to be quiet and enforcement by librarians.

In analyzing the percentages regarding the things that patrons desired to see "less" of in the Winspear, there were not many requests. The areas that had the highest percentages of "less" were the circulation and reference desk (7.8%), as well as the spaces for the print collection and book shelves (8.6%). However, these numbers were not especially noteworthy as these two categories also ranked the highest in "fine as is". Therefore, it can be assumed that a few patrons desired these areas to take up less space, while most of the questionnaire respondents believed these areas to be "fine as is". Intangible aspects of the Winspear that patrons wished to see "less" of included less heat, less doodling in study carrels and less talking. It would seem that patrons desire "less" of whatever might be distracting them from their work.

These findings are key to understanding the changes in spaces that librarians and decision makers could use to plan spaces in the future. In addition to these questions regarding "more" or "less" of particular aspects of the Winspear, patrons were also given the opportunity to comment on which spaces they would like to see changed, as well as specific places that worked well in the library.

Patron Comments on Changes to Physical Library Spaces

For the purpose of this research, it was important that the patrons be able to comment about changes that they would like to see in the physical areas of the Winspear. As library users are the ones who have in-depth knowledge about the functionality and use of the spaces, is was important that they be able to give input into possible areas of improvement. Numerous patrons (38.8%) took the time to comment on changes that they would like to see in the physical spaces in the Winspear.

Library Patrons Would Like to See More "Quiet"

The number one comment made by questionnaire respondents was about the need for more quiet in the Winspear. This is interesting, as it does not relate to specific physical spaces, but more about the nature of the spaces, and what needs to be done to ensure quiet study areas. Many of the comments pertained to the noise made by patrons who are talking in the library. As one person said: "I would like to see individual work spaces kept quiet – other students' conversations stopped". Many patrons seemed to feel that it was up to librarians to enforce no talking rules in the Winspear or to plan spaces that separated quiet and noisy areas. This is certainly in keeping with the findings of Leckie and Hopkins (2002) from a public library setting, where the majority of interviewed patrons thought that other library patrons should "be quiet" in a library environment (349).

The idea of separating areas for talking and quiet was a comment that came up frequently. As another patron noted, "One area could be designated as quiet, and another for people who talk". Talking and noise was one of the main concerns for patrons in this library. It is not only noise coming from patrons who are talking, but also other noises that patrons find to be distracting them from their work. As one patron commented, "Maybe have one floor dedicated to group work and talking, and then one floor quiet study space without photocopying or pencil sharpening". Library patrons seemed to find themselves distracted by a number of noises in this library, including talking, printing, noises from laptops, cell phones and other pieces of technology. Sounds made by laptop users, for example, can include such things as the "Windows startup tune", the laptop fan, and the sound of patrons typing, all of which can be very distracting to individuals trying to study. Bazillion and Braun (1995), emphasize the need to pay attention to noises associated with keyboard typing, and describe how sound proofing quiet areas needs to be a concern for library planners. Although some of these noises are unavoidable in a public place, it is possible that the design of the Winspear and set up of quiet versus noisy areas could help to eliminate a number these noises, such as better defined and specific areas for talking and laptop use.

Library Patrons Would Like to see More Space

Many patrons commented on the desire to see more "space" in the Winspear. Comments mostly referred to the spaces in general, although a few patrons made suggestions regarding specific spaces that they felt could use adjustment. As one individual said: “It is questionable how much the few books on the shelf are used. Moving them to a larger library to make room for study carrels would be smart”. This comment is interesting, especially in that it is validated by the small number of people observed in the book stacks during the observational sweeps (two people throughout the whole semester), as well as the other sections of the patron questionnaire (such as the low use of physical resources in the Winspear). When visualizing the size of the Winspear, it can be seen that the book stacks take up a large portion of the library (see Figure 2), and for many patrons this space is just too valuable to be taken up with a rarely used resource such as books.

Patrons also commented about the layout of the Winspear, and the excess amount of space being taken up not only by the bookshelves, but also in by empty space general. “There is a lot of unused space at the front of the library”. There seemed to be a general trend in the comments that the Winspear patrons did not believe that the library was set up as well as it could be to accommodate all the needs of the patrons, and that spaces such as book stacks and excess room at the front of the Winspear could be better designed. Patrons also commented on the lack of space and needed additions to the study carrels, “Bigger carrels on the first floor so that it is more comfortable would be great”, and another noted: “I personally think that work tables/chairs on the second floor are more comfortable to work on because the tables are not too high for the chairs, and also less distraction from people walking around on the main floor”. Along with the increase in space and comfortable seating for study carrels, many patrons commented that they wanted to see more lights in the study carrels, and for librarians to ensure that all lights work on a regular basis. In addition to more study carrels, patrons commented that they wished to see more study areas in general, as well as more access to things which make their work easier (e.g., more lighting, more electrical plugs by the tables, and stronger wireless signal and wireless printing).

Patron Comments on Spaces That Work Well in the Winspear

In addition to giving their opinions and comments on the spaces that patrons would like to see changed, it is equally important to understand what is working well in this library. Many patrons commented on how much they like this library, and 40.7% of questionnaire respondents took the time to comment on what spaces work well for them.

Study Carrels Work Well in the Winspear

In this library, one of the most popular areas for patrons to sit and work are the study carrels. A large number of patrons commented that the carrels (both on the main and second floor) work very well for studying and doing work. Patrons commented that they like the availability of outlets and lighting in the carrels, and also the placement of the carrels where there is a lot of natural lighting. The carrels on the second floor were mentioned as being very good for quiet studying, and quite comfortable, and the second floor carrels were thought to provide more individual space and less noise. Patrons really seemed to generally appreciate the study carrels for the sense of individual space and quiet that they provide. These findings are similar to those found by Cohen and Cohen (1979), who found that study carrels were preferred by library patrons, especially for quiet study. It seems that the nature and privacy of study carrels made them the favourite choice of many library patrons.

Work Tables Work Well in the Winspear

Many patrons in this library prefer to work at the work tables, and commented that these areas work very well in the Winspear. People seem to appreciate the amount of space that the work tables provide, although some patrons did wish for closer power outlets and a higher number of work tables. As one person noted: " The tables that are available tend to work well, more would be appreciated, there is physically not enough room for me elsewhere". Generally people seemed to like the work tables, although many did not specify the reason that they work well in the space. Although study carrels were found to be preferred by many patrons, work tables were also favoured by many individuals. These findings are in line with the study done by Xia (2005), who found that work tables were preferred by most library patrons in an academic library setting.

Group Study Rooms Work Well in the Winspear

Another of the most common things that patrons commented on regarding what worked well in the Winspear spaces were the group study rooms. These rooms are heavily used, and patrons really seem to like the fact that the rooms are equipped with computers and whiteboards. One person said: "Size of the group rooms are perfect. I also like that there is computer access in the rooms". Many of the patrons commented that the group study rooms suit their needs very well in terms of size, number of chairs, computer access, and white boards. However, although these comments were meant to be about what works well in the spaces, numerous comments also made reference to the limited number of the group rooms, and the desire to see more.

Other Areas and Things that Work Well in the Winspear

Patrons also made comments about a number of other spaces that work well in this library. A number mentioned the priority laptop spaces, as well as the quick access computers. However, patrons also included a number of individual comments about which spaces in the Winspear work well for them. As one person stated, "Having the computers right by the window is more relaxing, also I can keep an eye on my bike in the bike rack". Generally patrons enjoy the windows and amount of light that comes into this library through the large windows. In addition to this, library patrons seem to feel at home in this library, and consider many of the Winspear spaces and staff to be exceptional. As another person said: "This is a great place, one of my happy places! Exceptional staff, who exceed all expectations of customer service – very helpful friendly and knowledgeable". Although library patrons had numerous comments in regards to improvements that could be done to various areas, they also had many positive things to say about what works well in the Winspear spaces.

Conclusion

The Winspear has tried to offer numerous different types of spaces within a very small area to suit the needs of all its users. However, many patrons feel that changes could be made to the design and layout of seating in this library to make it more suitable for their needs. Examples of this include: issues surrounding areas of quiet versus areas of noise and group activity; areas where laptop users can access power outlets at tables; and larger more comfortable study carrels on the first floor. The design and layout of these areas are all important to fulfilling the needs of the patrons, and in many cases contributing to their academic success.

Through this study a clearer picture of what is going on in this library has been achieved. Issues of space planning are of concern to library administrators and planners, and this study has provided a look at one particular library and the use of its spaces. This study has implications not only for the library in question, but also other small academic libraries attempting to provide spaces for all the needs of library patrons and users.

CHAPTER 5

Conclusions

Introduction

The needs and functions for library spaces have been undergoing a substantial shift in recent years, much of which is tied to changes in the increased use of collaborative working spaces, and the widespread need for access and use of technology. The use of new technologies such as a PDA and GIS were invaluable for data collection and analysis in this study, and allowed for new ways of gathering and understanding the information collected about the activities occurring in this library. The activities occurring in the spaces in this library were sometimes in conflict (e.g., quiet studying occurring in close proximity to patrons talking), and the results show a need to redesign and change the layout of some of the areas in this library. Generally, library patrons want to see more diversity of spaces; but, given the limitations of space in this small academic library, considerations for change must be given to the highest priority needs of library users.

Who is Using the Spaces, and How? Patron Activities and Preferences in the Winspear

Patrons of a Small Academic Business Library

To better understand who was using this library, and the activities that they were engaged in, a triangulation of methods was employed to discover the characteristics of a variety of users and activities. The patrons of this library were almost completely undergraduate students (95%) from the faculties of Business (74%), Arts (11%) and Sciences (8%) among others. Patrons were observed (through observational sweeps) and reported (through patron questionnaire) to be engaged in a number of activities, largely throughout the week (Monday to Friday), and mostly during the day (e.g., 10 am to 4 pm). Generally, library spaces (such as study carrels) were heavily used, and thought to be adequate by library patrons. However, there were a number of spaces that were both observed, and reported to have a conflicting nature, or were not adequate in meeting patron wishes. It is these areas that require reconsideration in terms of planning and layout to better serve the needs of library patrons.

First Floor of the Winspear – Patrons Reading Versus Patrons Talking

The first floor of this library is used for a variety of purposes including a large area for quiet study. Unfortunately, although this is meant to be a place for quiet studying, many patrons also tend to do group work or carry out conversation in this area. This was both noticed in the observational sweeps, but was also commented on by a high number of patrons in the questionnaire. The proximity to the places where patrons are talking and where they are trying to study quietly is a place of conflict in this space (see Figures 8 and 9, Chapter 4). Library patrons find it very difficult to concentrate, as there is a lot of noise and discussion happening in this "non" group study space. Librarians have been having a great deal of trouble controlling the noise in this area, and numerous patrons have complained that there is too much talking going on in this area.

When looking at the furniture in these spaces, it becomes clear that certain types of activities are more likely to occur depending on the type of seating. In the study carrels, there is much more quiet reading and writing happening, whereas the worktables are where the highest instance of talking is occurring. In the case of patrons talking at the work tables, it becomes clear that patrons are mistaking the nature of the furniture (e.g., tables) for a place where they are allowed to talk. There was a great deal of confusion on the part of many library patrons about the purpose of the work tables. This certainly becomes evident through the number of comments by the Winspear patrons such as: "You can easily do group work at the discussion tables on the 1st floor". It seems that a number of library patrons have mistaken the work tables as "discussion tables" or places for group work due to the shape of the furniture. Given that there are only three group study rooms, those who are not able to book ahead may well turn to the first floor study area for a place to do group work. However, as this is actually meant as a quiet study area, those who are trying to do individual work are being disturbed by those talking. Many patrons desired to see the group tables separated from the individual areas, as they found the work tables encouraged talking amongst library patrons. According to the feedback from the patron questionnaires, areas designated for people who want a place to quietly study, separated from spaces where patrons could engage in quiet discussion, would be welcome by library patrons. Powell recommends that quiet study areas be situated away from noisy and group study areas (2002, 116). Although the small size of this library makes planning difficult (as everything is close together), in this case, it would seem that a new area where quiet discussion could be expected would be an asset to the spaces in this library.

The Need for More Spaces for Group Study

In addition to a separation of quiet and areas designated for conversation, was the desire to see more spaces for group study. An increase in places for group study is one of the most important things that students in this library described being needing in this library, and according to library patrons only three group study rooms are not enough compared to the number of people needing to do group work. With over 50% of the Winspear patrons using the library for group work, it would seem that an increase in spaces to allow for group work are needed.

Use of Computers and Laptops

There was a high number of patrons that were both observed or reported using library computers (15% observed, 71% reported as using library computers) or laptops (20 percent observed using laptops, 60% of laptop owners using laptops on a regular basis in the Winspear). In keeping with the University of Alberta library patron survey (2005), some library patrons (63% quick access and 53% sit down computers) reported wanting a higher number of computers or computer spaces provided by the library, but did comment about how they found the number and availability of computers in the Winspear to be an asset to the library services. It seems that patrons, although they would like to see more, are generally satisfied with the computers provided by the Winspear.

However, patrons in this library did not feel that the spaces and amount of areas for laptop use to be as adequate. Patrons reported that spaces were not big enough (especially with books and other belongings in the study carrels), that lights and electrical outlets often did not work. In addition, with the GIS visualizations showing that patrons mostly made use of work tables or areas where there was additional space, such as work tables or the end seats of rows of study carrels (see Figure 11, Chapter 4), clearly individuals using laptops are looking for places that offer more room than the current facilities. With twenty percent of the library observed using laptops, which was the second most frequent activity occurring in the Winspear after reading and writing, it would seem that more spaces need to be provided for this activity.

Not only do laptop users require additional spaces and have special needs for these spaces, but it is to the benefit of other patrons for laptop users to have special areas away from places where patrons are engaged in quiet study. For example, as with talking, noises from laptop users can be very distracting to other library patrons. Noises such as the "Windows start up", laptop fans and noises from patrons typing, can all be very disturbing to other surrounding individuals attempting to work in a quiet environment. Therefore, spaces allotted to laptop users in areas away from quiet study areas would be beneficial to library patrons.

Justification for New Spaces – A Place for Laptop Use and Quiet Discussion

Lack of Use of Stacks

In this library, the stacks take up a great deal of room, and it is thought by many librarians and patrons to be "prime real estate". However, in contrast to the amount of space taken up by these resources, only 0.2% (two individuals in total the whole semester) were observed physically searching for materials in the stacks or book shelves throughout the observations. In addition to the observed number of people using the stacks, only a little over 5% of patrons reported using the physical print resources in the Winspear. Interestingly 74.1% of patrons reported in the patron questionnaire that the stacks were "fine as is". This points toward the idea that library patrons do like having the books in the library, even if they are not being used. However, with this low number of people using the stacks, library planners may want to reconsider the amount of space allotted to these resources.

This is not a new idea, and scholars have commented on the need for removal of physical materials to make room for users and new user activities (Engel and Antell 2004; Bazillion and Braun 2001; Ramsay 2002; Pengelley 2001). In fact Finnerty (2002), describes how special libraries are on a "path away from the stacks", and how libraries are no longer in need of their "just in case" collections that dominate the library's physical space (8). With little room available in this library, as it is, the large amount of space occupied by the physical collection did not go unnoticed by library patrons, many of whom commented that the books on the shelves are not used by patrons, and that these spaces would be much better used as additional areas for seating.

There are multiple solutions for the removal of physical collections from library spaces. When discussing planning small law libraries, Chiorazzi (2002) suggests the implementation of flexible planning for space, including remote storage, digitization of parts of the collection, redesign of stacks and compact shelving as methods that might be considered by library planners (19). Although this study is set in the law library context, these suggestions are equally applicable to the library in question.

Recommendations for New Spaces in the Winspear

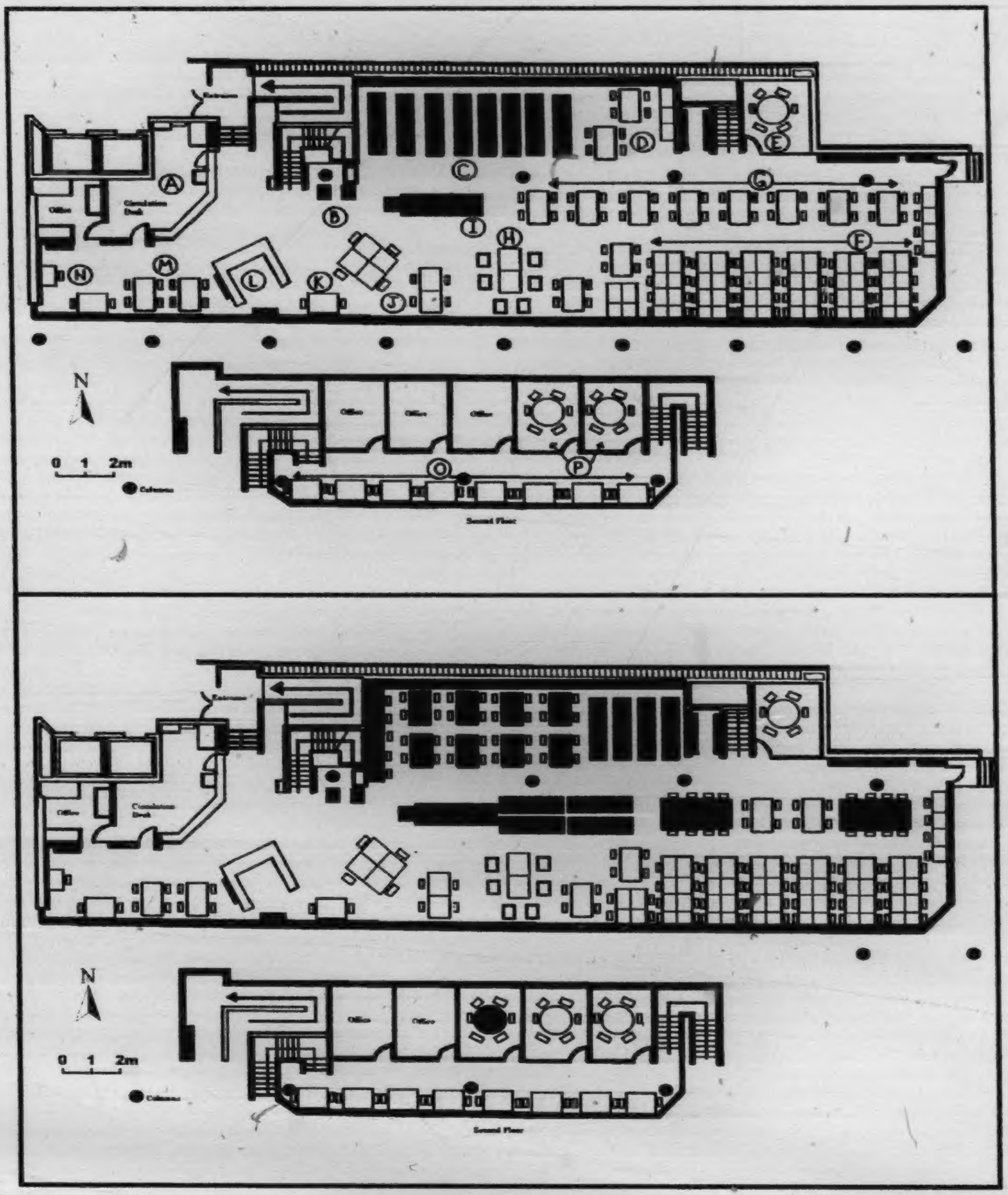
Thanks to the amount of data and feedback collected throughout this study, as well as the GIS visualizations, a clear idea of the needs of patrons, areas for improvement and desired future directions have become apparent. Although this library is small, and serious renovations perhaps impossible, there are a number of solutions that may be created for the existing library spaces. The major concerns of library patrons in this library are the lack of separation of quiet and noisy areas, the desire for more areas for quiet discussion and group work, and additional areas for laptop use with a better variety of space and power outlets. Thanks to the GIS visualizations, the map was easily transformed to represent a new area where laptop users and library patrons could engage in quiet conversation could be created. The proposed layout for improved spaces in this library takes a number of factors and current patron needs into consideration.

Additional Areas for Group Work

It would be recommended that the library increase areas for group study and discussion in the Winspear. Options for an increase in places for group study could mean that other areas in the building could be provided (e.g., rooms outside of the Winspear), or spaces for additional group work rooms created within the existing library spaces. As multiple rooms on the second floor of the Winspear are used for offices, making even one of these rooms into an additional room for group study would be helpful. However, there are already a limited number of places used as offices for library staff, therefore the creation of a new group study room out of these offices may not be possible. Other options could include a library expansion project to some of the offices on the outside of the actual library to be used as group study rooms for library patrons.

A second recommendation would be the creation of a new area for library patrons. The improved layout design (see Figure 19) adds two new areas appropriate for group work and quiet discussion (shown in darker color where book stacks area "C" were in Figure 19). As discussed above, the addition of another group study room would be beneficial for library patrons needing to get together for group work and meetings in an enclosed space (see new room to the left of section "P" in Figure 19). This would also allow for students to have the option of reserving a room beforehand, as is done with the other three rooms. However, as previously mentioned, this may not be possible due to the limited amount of spaces available for staff offices.

However, the biggest improvement in this new library layout is an area designated as an area for quiet conversation and laptop use. This new area (shown in Figure 19, replacing area "C" in Figure 19), would provide an area to users where they may talk quietly in groups if the other group rooms are being used. To create this new area, stacks could be removed and placed in remote storage, or (as seen in this layout) could be moved to the middle of the Winspear, placed to the back and also function as a kind of sound barrier between this area and the area with study carrels which is an area for quiet studying. The creation of this new area would allow for additional space for quiet discussion, while also being separated from the quiet areas.


Entrance
Circulation Desk
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A
B
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Columns
Second Floor

Figure 19 – The current layout of the Winspear Library (top) and suggested improved layout for library (bottom). In the bottom figure note that the additional work tables replace where book stacks previously stood, and additional carrels where work tables once were.

In addition to an area for quiet conversation, this area could also serve as a laptop friendly area. As the ceiling is much lower here than in other areas of the library, it would be easier to add in additional wiring, as opposed to other areas of the Winspear (such as the location of the work tables before), where wiring was more difficult due to the concrete flooring. Therefore, lighting and electricity to accommodate the needs of laptop users could be met. In addition to this, a separated area for the "noisier" type of activities such as quiet discussion and laptop use makes much more sense in this area (close to the noisy photocopier and reference desk where people may be talking) than closer to the back, which would be designated as a total quiet area.

To decrease the amount of talking occurring in the quiet study area, additional carrels would be needed to cut down on patrons confusing the work tables as group study areas. These additional carrels would also serve as sound barriers to the laptop and quiet conversation area, therefore serve a double purpose – increasing the amount of seating in the Winspear, and blocking sound from other areas. However, a few work tables would still be left to diversify the study space and create a more open feeling between the study carrels.

As described by Pengelley (2001), this and other small academic libraries must use the room taken up by collections for expanding reading and meeting areas for students by "re-inventing" the spaces. In this case, re-inventing the spaces means creating new spaces for patron activities in the already existing library spaces. As this is an older library that has not undergone any renovations since its opening, library planners must provide separated areas in the pre-existing library spaces for both quiet and noisy activities. The creation of separated, and yet flexible study spaces, allow for a variety of multiple and diverse types of activities in which library patrons engage everyday.

Use of PDA for Data Collection and Data Analysis

PDA As A Tool for Data Collection

This study made use of a PDA to collect observational data on the activities and possessions of library patrons. This method for collecting data was efficient and useful for collecting the information, but also for easy transfer of data to a personal computer for additional analysis. As discovered by Hecht (1997), this method is believed to have been much quicker and more efficient than paper and pencil methods for data collection. However, in addition to these aspects of PDA data collection, this method was also thought to be much less obtrusive and covert than a pencil and paper method. As this library has many patrons using these types of technology themselves (e.g., mathematical calculators, PDAs, and cell phones), the researcher seemed to fit in much more with the surrounding area and patrons then if other methods had been used. As Atkinson and Figueroa (1997) discovered, business students see new technologies as giving them a "competitive edge", and therefore the widespread use of personal technologies in this library allowed the researcher to fit in well with the other library patrons. This was important to ensure that patrons were carrying out activities that they would normally as much as possible, without feeling that they were being observed. In this case it appeared that most patrons were not aware of the researcher, which may not have been the case with other methods.

GIS as a Tool for Data Analysis and Visualization

The use of GIS as a tool for analysing the observational data was invaluable for a better understanding of the activities and use of spaces in this library. Researchers and librarians are already using observations to better understand the activities of patrons in various public and academic library settings (e.g., Leckie and Hopkins 2002; McKechnie 2004; Shill and Tonner 2004), however, being able to visualize the results and patterns from these observations with an easily manipulated software is the benefit of using GIS over other statistical software programs alone (e.g., *SPSS* or *Excel*). In GIS, any number of different views and maps can be used depending on the needs of the researcher, and the amount of data collected. GIS can be used to facilitate an iterative process in the analysis of observational data where researchers can explore the data to identify new themes or problems in the areas, as well as new questions theories about the spaces to build strategies and ideas for improvement to the spaces.

GIS as an Appropriate Tool to Visualize Use of Small Library Spaces

In the case of this study, GIS was an appropriate tool to used to visualize and make clear a number of problem areas in this library. The visualizations performed in this study could not have been done with such accuracy, or with such easy manipulation in any other software program. In addition, at any point further investigation into different aspects of patron activities or possessions could have been mapped. With the observational data having been collected throughout different times of day, over the span of a number of months, GIS allowed the researcher to manipulate the data and see differences between months and times of day (e.g., laptop use on a Thursday morning in September versus use on a Friday afternoon in November). However, most importantly, this method enabled not only the statistics and data to be compared (which is possible with other programs), but the comparisons also seen and visualized. This is the most important aspect of the use of this software – the ability to really see where the problem areas are in a space, and be able to query the data at any point to produce additional visualizations and theories about what is going on in the spaces. The ability to query the data through the GIS is in keeping with the holistic look at patron experiences and activities in this space, as any number of variables about any number of patron activities could be easily visualized and compared. This type of visual analysis and understanding of the data could not have been achieved with any other types of software or methods.

The advantage of GIS is that it offers visual evidence of what is going on in the spaces, and also visual proof of where the problem areas are occurring and where changes need to happen. These examples of visual evidence can be extremely powerful in terms of helping library planners to design spaces, as well as enable the presentation of the problems in library spaces in a visual format to boards or decision makers. In terms of the visualizations achieved through this research, the maps will be used to help plan library spaces in the future, as well as for visual proof to be shown to decision makers as reasoning for renovations and funding to help make changes to the spaces in this library. Further discussion on how exactly these visualizations can help understand the Winspear spaces will be discussed further on in this Chapter.

Areas for Future Research

This was a small exploratory study (designed in part to test the utility of GIS) There are a number of ways that this research could be extended. First of all, as this is a masters study, data collection and analysis were performed by the primary researcher alone. Given the available time and resources, only a small sample size and amount of data were collected (e.g., a limited number of days for observational work). This was planned by the researcher to ensure the study did not become overwhelming, and that the researcher would be able to properly analyze the data in the time available. For future research, a larger sample size and a variety of different days of the week would be desirable.

In addition to a larger sample, other methods could have also rounded and increased understanding about what is happening in these library spaces. Ways of expanding this study could include qualitative interviews with library patrons, or additional information about the ages of the patrons. Although it was found that patrons were largely under the age of 30 years old, a more specific breakdown of the ages of patrons would be an asset to helping to understand needs and behaviours. As well as more information about patrons, the opinions and ideas from library staff would also be an asset to understanding the spaces. A staff meeting was attended during this study, which had valuable results for deeper understanding of the spaces, and additional in person interviews with the staff would likely yield some interesting results.

In terms of the use of GIS methods for better understanding library spaces, these techniques could also be very useful in a larger academic library or public library setting. GIS can help to visualize spaces, and this can have important implications for larger institutions, especially those that might be confronted with issues and problems surrounding conflicting patron uses of spaces. GIS helps to provide visual evidence of the activities and problems in various areas, and can be used to help library planners and decision makers to see what is going on in the spaces, and plan accordingly.

The library's space needs are evolving, not shrinking. Studies on how library patrons use and need spaces are only beginning to be explored, and this study is one step in the direction of better understanding of how patrons use a small academic library. However, a great deal more work needs to be done on understanding these spaces before we can design and plan them to suit the current needs and desires of library patrons. Although many of the functions and ways that library patrons are using spaces are changing, library planners must be at the forefront of designing flexible spaces which meet the needs of today's users.

It seems that over the past decade with the beginnings of the "information age" that libraries have moved steadily away from being repositories of printed materials to something more complex, more exciting, and more indeterminate. The goal of the academic library should be to enhance learning in the information environment, and add a sense of community to library spaces. By integrating the library into the learning process (e.g., through providing more spaces for group study; removal of stacks for more spaces for patron activities), and designing spaces and creating policies to fit with the patrons' real activities and needs, the the library becomes an extension of the formal learning process and helps to meet the goals of the larger institution. It is through the extension of the library as a place of learning that library planners can re-think library spaces, which will make libraries indispensable to the academic community for scholarship, teaching and lifelong learning for the future.

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Appendix A – Seating Sweeps Observational Checklist

Winspear Business Reference Library Seating Sweeps – Sample Codes (modified from Given and Leckie 2003).

Demographics
Male
Female
Age estimate: Under 30
Age estimate: 30-60
Age estimate: Over 60

Activities
Reading
Writing
Using library computer
Using other library technology (photocopier etc.)
Using laptop
Physically searching
Talking
Using cell phone
Using PDA
Using Calculator
Listening to walkman/MP3 player
Eating/Drinking
Sleeping
Just watching/sitting
Interacting with staff
Touching another person
Other

Site locations
First floor
1= Work tables (a,b,c, etc.)
2= Study carrels (row a, row b, row c, etc.)
3= Computer workstations (section a, section b, etc.)
4= Journal stacks
5= Book stacks
6= Reference desk

Second floor
7= Study carrels (section a, section b, section c, etc.)
8= Group study rooms (a, b, c, etc.)

Appendix B -Library Spaces Questionnaire

Thank you for participating in this survey. The results of this questionnaire will be used toward a master's thesis project on library space at the university, and will be used to better understand the spaces observed in the study. This information will be confidential, so please do not identify yourself on this questionnaire. There are no questions that ask you for any information that could result in your personal identification. This study is not sponsored by or connected to the Winspear Library. However, the results of the study will be shared with library administrators to inform future planning in creating quality spaces in the library.

If you have any questions about this project, please do not hesitate to contact Heather Simpson (the researcher) at hsimpson@ualberta.ca, or Dr. Lisa Given the advisor for the project at lgiven@ualberta.ca or (780) 492-2033. The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Faculties of Education, Extension and Augustana Research Ethics Board (EEA REB) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the EEA REB c/o Bettyjo Werthmann at (780) 492-2261.

1. **Are you a (please check one):**
   ☐ Full-time undergraduate student
   ☐ Part-time undergraduate student
   ☐ Part-time graduate student
   ☐ Full-time graduate student
   ☐ Sessional instructor
   ☐ Faculty member
   ☐ Staff member
   ☐ Librarian
   ☐ Community member (not affiliated with the U of A)
   ☐ Other (please specify) ________________________

2. **If you are affiliated with the U of A, what unit are you with (please check one):**
   ☐ Agriculture, Forestry and Home Economics
   ☐ Business
   ☐ Engineering
   ☐ Law
   ☐ School of Native Studies
   ☐ Pharmacy and Pharmaceutical Sciences
   ☐ Rehabilitation Medicine
   ☐ Faculty of Science
   ☐ Non-academic unit
   ☐ Arts
   ☐ Education
   ☐ Extension
   ☐ Medicine and Dentistry
   ☐ Nursing
   ☐ Phys Education and Recreation
   ☐ Faculté St. Jean
   ☐ U of A administration

3. ☐ **Male** ☐ **Female**

4. **How old are you?**
   ☐ 29 years or younger ☐ 30-60 years old ☐ 61 or over

5. **How often do you typically visit the Business Library in person? Please check one.**
   ☐ Once a day ☐ Once a week ☐ Once a month ☐ Once a term
   ☐ Once during the academic year (September to April) ☐ Less than once a year

6. **What times of day do you usually visit the Business Library in person? Please check all that apply.**
☐ Morning (8:30 to 10am) ☐ Mid-morning (10am-12am) ☐ Mid-day (12 am to 1pm)
☐ Early afternoon (1 to 3pm) ☐ Late afternoon (4 to 6pm) ☐ Evening (6pm to 10pm)

7. **What days of the week do you usually come to the Business Library? Please check all that apply.**
☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday
☐ Saturday ☐ Sunday

8. **In what months of the academic year do you usually make the most in person visits to the Business Library? Please check all that apply.**
☐ September ☐ October ☐ November ☐ December (before exams)
☐ December (during exams)
☐ January ☐ February ☐ March ☐ April (before exams)
☐ April (during exams)

9. **Do you use the computers in the Business Library?**
☐ Yes ☐ No (If no, go to question #11)

10. **When you use the Business Library computers, what do you use them for? Please check all that apply.**
☐ Searching for materials on the library computer ☐ Working on papers/projects/presentations
☐ Checking my e-mail ☐ Playing games
☐ Other (Please specify)

____

11. **Do you have a laptop?**
☐ Yes ☐ No (If no, go to question #12)

A) How often do you use your laptop in the Business Library?
☐ Never ☐ Seldom ☐ Occasionally ☐ Frequently

B) Do you feel that the spaces provided for you to use your laptop in the Business Library are adequate (e.g., enough outlets, enough room to work in the study carrels, etc.)?
☐ Yes ☐ No ☐ Don't know

If yes/no, please comment about why or why not –

____

____

12. **What other kinds of activities do you usually do in the Business Library? Please check all that apply.**
☐ Reading/Writing ☐ Preparing for an exam
☐ Using other library technology (microfiche etc.) ☐ Just watching/sitting
☐ Asking the librarian a question ☐ Sleeping
☐ Eating/Drinking ☐ Socializing with peers
☐ Working with a group ☐ Reading newspapers
☐ Using other personal technology (e.g.., PDA, calculator, MP3 player etc.)
☐ Physically searching for print materials (e.g., among the bookshelves)

☐ Other ______________________ (please specify)

13. Do you have a preferred place to sit in the library?
☐ Yes ☐ No (if no, please go to question #14).

If yes, where? Please check one.
☐ Study carrels (first floor)
☐ Work tables (first floor)
☐ Comfortable couches/chairs by windows
☐ Other (please specify)
☐ Study carrels (second floor)
☐ Group study rooms (second floor)
☐ Computer stations (first floor)

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14. In your opinion, finding a place to do INDIVIDUAL work in the Business Library is…
☐ Very easy ☐ Easy ☐ Difficult ☐ Very difficult
☐ Don't do individual work in the Business Library

Please make a comment to explain your answer.

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15. In your opinion, finding a place to do GROUP work in the Business Library is…
☐ Very easy ☐ Easy ☐ Difficult ☐ Very difficult
☐ I don't do group work in the Business Library

Please make a comment to explain your answer.

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16. How often do you use the group study rooms in the Business Library?

☐ Once a day ☐ Once a week ☐ Once a month ☐ Once a term
☐ Once during the academic year (September to April) ☐ Less than once a year

17. Thinking about the quality of the existing physical space in the business library, what would you like to see change at the library? For each of the following, choose either "more" or "less" or "fine as is".

	MORE	**LESS**	**FINE AS IS**
Space for Individual Studying	☐	☐	☐
Comfortable reading spaces (e.g., couches)	☐	☐	☐
Space for the circulation/reference desk	☐	☐	☐
Work tables	☐	☐	☐
Spaces for group studying	☐	☐	☐
"Sit down" computer terminals	☐	☐	☐
"Quick access" computer terminals	☐	☐	☐
Spaces for laptops (i.e., with plug-ins)	☐	☐	☐
Space for the print collections/book shelves	☐	☐	☐
Clocks	☐	☐	☐
Natural light or other lighting	☐	☐	☐

Other (please specify) - ______________________________

18. Please specify additional changes you would like to see made to the physical spaces in the Business Library.

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19. Please specify spaces that work well in the Business library.

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Thank you for your participation! Please submit your finished questionnaire to the box at the reference desk or at the table at the entrance to the library.